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UNNATURAL CAUSES:
THE THREE LEADING CAUSES OF MORTALITY IN AMERICA

Russell C. Maulitz, *Editor*

Celebrating the Two Hundredth Anniversary of the College of Physicians of Philadelphia

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Acknowledgments

On November 20–21, 1987, the College of Physicians of Philadelphia concluded a scientific symposium on the three major causes of mortality in the United States: cardiovascular disease, cancer, and trauma. This symposium marked the culmination of the bicentennial celebration of the College's founding. In a yearlong observance, filled with festivities including a visit from the President of the United States, the College kept its eye on its mission. This volume constitutes a tangible and lasting expression of that constancy.

Among the many individuals that helped make successful the College Night lecture series and the symposium from which most of the articles in this volume have been drawn, the College wishes particularly to thank its Bicentennial Program Committee: Robert Austrian, M.D.; Lewis W. Bluemle, M.D.; Lewis L. Coriell, M.D.; Robert S. Pressman, M.D.; Jonathan E. Rhoads, M.D.; Brooke Roberts, M.D.; and George L. Spaeth, M.D. Dr. Rhoads, along with Drs. Charles C. Wolferth and J. Edwin Wood, capably moderated the symposium sessions on cancer, trauma, and cardiovascular diseases respectively.

Finally, we wish to express the College's gratitude to Mary E. Groff, Esquire, and the Groff Family Memorial Trust. Their consummate and visionary generosity provided support for the symposium on which this volume is based, and made possible the publication of the important articles you will find in the pages that follow.

—The Editor

PART I

Unnatural Causes

Chapter 1

Is This the Way We Want to Die?

RUSSELL C. MAULITZ

Often I am reminded of the first time I had to talk to a cancer patient about his prognosis. The gentleman in question, call him Mr. Smith, had a moderately advanced case of carcinoma of the prostate gland. It is more or less a commonplace that this particular form of cancer, prevalent in men in the later decades of life, is only slowly invasive. Even when it metastasizes widely, this cell, in a way that is somewhat atypical among malignant disorders, may yet allow the patient years of remaining life. Thus it was that I faced a dilemma, balancing gloom and optimism, my first time breaking such news to a patient. "Mr. Smith," I heard myself say, "you have a malignancy. But if you're lucky you can beat it," I added, "and go on for several more years with our help. In fact, we all have to die sooner or later—and when you do, it may very well be of natural causes."

Ever since I made that statement, I have wondered what it meant. Is there such a thing as a "natural cause"? We may deem abnormal that which is disfiguring and insidious, like cancer, or disfiguring and random, like trauma or violence. Because of the suddenness with which it strikes us down, we fear a heart attack, with its clumps of cholesterol, its little atheromatous rock piles, and its sudden jagged short circuits in the heart's electrical wiring system. What does all that leave in the diminishing realm of the "natural"? Perhaps we wish for that graceful departure, the "good death," hailed by the ancient bard and celebrated again in our own time in the mythical reaches of Shangri-La, where the lives of the wise stretch out for centuries before they gently fade from the scene.

Some ways of exiting this world certainly seem more "natural" than others. Many persons, at least those imbued with Western

cosmologies, look, especially, upon cardiovascular disease, trauma, and cancer as unnatural. These disorders are seen as assaults on our rational and progressive views of the way the world is supposed to work. In looking at these modern epidemics, one wonders whether men and women have always felt this same sense of betrayal. Did consumptives in the nineteenth century conceive of tuberculosis as the ultimate destiny of humanity, or did they conceive of it only as a malediction temporarily to be borne, until the remedy was at hand? Perhaps "natural causes" are simply those causes perceived as hard wired into the body grown old, rarely if ever striking down men and women in their prime as — cancer, heart attack, and trauma so often do.

Questions of this sort point to a gap in our knowledge of the experiential history of modern medicine, resting as it does on the history of lived illness, disease as seen from the inside looking out. Historians have barely begun to scratch the surface of this problem (1). In the meantime one hypothesizes: surely there has always been a tension between the three basic conceptions: 1) the fatalistic view — death by any instrumentality is natural; 2) the triumphalist view — the only natural death is one foreordained by the natural running down of the biological clock; 3) the aesthetic view — the natural death is the good death, the cleanly anticipated death.

In the late 1980s there are few fatalists of the old school and, when it comes to death, not many aesthetes either. Hence the three sets of disorders with which the authors in this volume are concerned are perhaps the most dreaded among people's afflictions in these times. What seems most immediately assaultive about them is the fear they strike — how often they occupy us, when we care to admit it even to ourselves, in our night thoughts. At the same time, in sheer numbers, the three leading causes of disease — cancer, heart disease, and violence — also happen to be the three leading killers. They devastate more of us than any and all of the other mortal perils to which we are heir.

True, near the end of the twentieth century other disorders of soma and society — most notably AIDS but also conditions such as mental illness and homelessness — have conspicuously come to occupy our attention. Is one of these, perhaps AIDS, culturally the dominant disease of our era just as, some have contended, tuberculosis was 150 years ago? Certainly, the re-

turns are not yet in. But it is clear that each of the three leading "unnatural causes" we are discussing can be seen to dominate one of the three relational spheres in which we all move and work. In the world of interpersonal relations, violence and trauma, especially intentional trauma—inflicted by oneself or by others—dominate the landscape. In the created world we have fashioned since the industrial revolution, a world laced with processed foods and smokestack emissions, cancer and cardiovascular disease vie with each other for the distinction of "dominant" disease. In the world within each of us, where our genetic and constitutional selves are expressed, there is, overwhelmingly, cancer. No doubt it is because of that, the enemy within, that cancer occupies such a central position of dread.

Fateful Diseases

Unnatural Causes commemorates the first two centuries of one of America's oldest medical societies, the College of Physicians of Philadelphia. Both the college and the nation, in whose formation many of the college's early leaders played a part, are preparing for a new, third century, a time of growth and change. So, too, are the authors in this volume, peering through their collective glass at the start of the new century, looking at the three leading causes of mortality in the United States today: cancer, cardiovascular disease, and trauma. They look at these three classes of disorder in a manner that is fresh and unblinking, asking whether we are consigned for all time to this doleful ordering. Each author looks at his or her topic in double-barreled fashion, examining the traumatic, cardiac, and malignant disorders in both of their guises: as disease and as public health hazard. Nearing the end of the twentieth century, American physicians and educated lay people alike find themselves torn between two equally terrifying alternatives.

In one direction is the fear that medical science has finally met medical nemesis, amid the rubble of the ideal of scientific progress. In this view, which may be overly governed by the tyranny of the present, we have reached the end of the line—a massive wall of resistance built by the combined force of our inherent biological nature (cancer and cardiovascular disease) and our inherently destructive social nature (trauma, violence, and sui-

cide). This deeply pessimistic view suggests that, after the respite afforded by the halcyon era of antibiotics and the partial conquest of infectious diseases, the fuses on our biological and social time bombs have now grown perilously short.

A view that is in many ways opposite to this, yet also antitriumphal, suggests that whereas every society creates its own diseases, there is a plasticity to the morbidity and mortality patterns that preoccupy our epidemiologists. Yet, just as the incidence, for example, of stroke and certain forms of cancer can be shown to be diminishing, we are beset with new diseases — most notably the Acquired Immune Deficiency Syndrome (AIDS) —that suggest we merely trade today's pestilence for tomorrow's plague.

Are we, in fact, consigned to one or another of these fates? The authors in this volume attempt no universal answers to the thorny issues posed by the epidemiologic trends of the late 1980s. They offer no global solutions to the twin problems of our ostensible biological time bomb: "doomed nature" and human self-destructiveness, what one might call "doomed nurture." They do provide us with an intellectual toolbox with which we may equip ourselves as we begin to grapple with some of these difficult issues.

Approaching the Problem

The tools in this kit are demanding but utterly fascinating. Thus the chapters in this book defy easy categorization. Most of them straddle a variety of disciplinary approaches, invoking concepts drawn from areas as disparate as molecular biology and behavioral science as well as from epidemiology and political economy. The authors are world leaders in their fields. They are characterized by unconventional thinking and fresh insight into the diseases on which they concentrate.

In addition to the axis of optimism versus pessimism, and that of nature versus nurture (or biology versus social science), the authors implicitly view the three leading causes of mortality on the axis of acute versus chronic illness. All three, in fact—cancer, trauma, and heart disease — can be seen to span the two poles of this dichotomy as well as the points in between. There is no single paradigm for this, no unidirectional course for time and

medical progress. Some parts of the disease spectrum yielded first at the chronic end (rheumatic heart disease, for example), only to leave a residue of seemingly implacable acute ailments (myocardial infarction and sudden death). In other cases the palliation of acute disorders (for example, certain presentations of malignant disease) left a residue of formidably challenging, and economically devastating, chronically ill patient populations.

The issue of how to manage the chronically ill in America is not a new one, as Daniel M. Fox demonstrates in the second chapter in this volume. In an introductory essay that serves as a companion to this one, Fox sets the stage for the chapters that follow by shattering some old shibboleths about American institutions' ostensible abandonment of their chronically ill. Fox demonstrates how different parts of the health care "industry" accommodated themselves in differential fashion to the problem of chronic disease. He shows in detail how the hospital and research communities adapted to the changing epidemiologic picture, while the third-party insurers lagged for their own peculiar reasons. This discordance among the different sectors in their degrees of acceptance and adaptedness to the problem remains a critical problem in the final decade of the century. It is a critical problem that may reach the flash point because of a rapidly aging population, and because of the particular difficulties posed by the AIDS epidemic.

Heart Disease and Modern Medicine

For cardiovascular disease, two distinguished physicians, one a surgeon and one an internist, confront the core issue of modern heart medicine. Rheumatic fever, though now displaying a modest resurgence, began declining a generation or more ago. Now, much more recently, stroke has followed suit. What is left primarily is the problem of cardiomyopathy and atherosclerosis, with which both Bernard Lown and Stanley J. Dudrick *et al.* deal in their essays. Tellingly, and unexpectedly, these authors depart from the expected paradigms of physiology and molecular biology. While intimately versed in these fields, and conversant with the tools needed to map the electrical and metabolic pathways of the heart and its blood vessels, Dudrick *et al.* and

Lown have moved over a notch and begun to ask about how these pathways are influenced by environmental insults and adaptations.

Dudrick *et al.* look for ways in which nutritional and other related environmental factors can be manipulated. They discuss their attempts to reverse the progression of the tiny plaques that, by occluding the heart's lifeblood, occlude more Americans' futures than any other disease. Similarly, Nobel laureate Bernard Lown insists that a much broader perspective than the "normal" reductionist model of electrophysiological catastrophe must be invoked to understand sudden death. He presents evidence that cultural and behavioral factors are intimately involved in the neurochemistry and neuropsychology of sudden cardiac death. He suggests future directions for the study of these disturbing phenomena which will only become amenable to intervention, he insists, when we achieve a better understanding of the interconnections between soma, psyche, and society. Some readers will deem his conclusions, based upon what is essentially a notion of the epidemiology of stress, to be controversial; but the College of Physicians has never attempted to sidestep controversy. Indeed, Lown's views are presented here partly because we remain convinced they will be heuristically useful, falling as they do within a grand tradition of Harvard medical thinkers, such as Walter Bradford Cannon, concerned with the morbidity and mortality associated with autonomic dysfunction and bodily changes in the setting of stress.

The Cancer Problem

The authors of Part III deal in a variety of ways with the recalcitrant problem of malignant disease. Technically challenging, yet crucial to any understanding of cancer, is the oncogene story, well told by Robert A. Weinberg. This extraordinary and only recently elaborated concept of genes inherent to the host's living cell — hence not some viral or other "invader from without" — provides the vital underpinning to any future campaign to eradicate cancer. Weinberg provides a chronology and brief introduction to this arcane and difficult subject.

In a more somber mood, Philip Cole provides a counterpoise to the hopeful auguries of the oncogene story, through a brief

overview of the recent epidemiology of cancer. Employing the arresting metaphor of light bulbs and wine glasses — the first burns out at a preordained moment, while the second breaks randomly at virtually any time — Cole asks whether most interventions are not actually "nibbling at the edges," that is, palliative, and whether most cancer deaths are not "hard wired." At the turn of the century, he concludes, malignant disease will be the major cause of death.

Bruce A. Chabner and Marcia J. Browne are considerably less pessimistic as they briefly examine a series of novel approaches to the pharmacotherapy of cancer. Building upon the data and some of the interpretations of Chabner, Browne, and, especially, Cole, Edward Sondik extends these authors' arguments while reaching conclusions that suggest more clear-cut, although still measured, cause for optimism. Using exhaustive statistical data, Sondik adds weight to the view that cancer may be more than simply effaced at the margins. Sondik emphasizes the often overlooked importance of applying what we already know — that is, efficiently managing the transfer of technology — in addition to pushing out the boundaries of knowledge through new research.

Cancer and cardiovascular disease are big killers, so-called glamorous diseases, attracting the trappings of big science and big philanthropy. In what may be the most innovative set of chapters in this volume, Susan P. Baker, G. Tom Shires, and Mark L. Rosenberg assess the issues surrounding a much less glamorous problem, one that has lain so far outside the nexus of high technology and high society: the explosion of violence and trauma in America. Each of these authors hails from one of several newly minted institutional entities set up to deal with the epidemic. Each author insists on treating violence and trauma as preventable public health problems rather than as some sort of inevitable manifestation of moral opprobrium.

These authors are also capable of outrage over the maldistribution of risk in the epidemiology of trauma. Baker, in particular, depicts for us, in grisly detail, just what we tolerate in our sociocultural structures—and how our laxity permits the loss of life through accidental as well as intentional trauma.

In useful contrast, while ultimately reaching similar conclusions, Rosenberg argues that what we deem "accidental" is more often than not not really so accidental after all. He argues rig-

orously for a national plan, based upon sound public health principles, whereby individuals at risk might be identified. This is no more a romantic, classically liberal view than that of Baker —he insists, for example, that we need to deromanticize suicide —but rather a practical *vade mecum* for a determined and coordinated national antiviolence effort. In his somewhat briefer chapter, finally, Shires provides a nuts-and-bolts account of how one beleaguered city, New York, has already begun to tackle the problem.

Tentative Prescriptions

Alvin R. Tarlov and Paul D. Stolley provide, respectively, two useful retrospective views on the problems that have led us to the current pass, suggesting some tentative prescriptions. Tarlov surveys medical education over the past century and argues for a new paradigm in the education of future physicians. These individuals must interpret and deploy the efforts of the biomedical disciplines. Tarlov suggests a much less constricted set of paradigms is needed to pursue a wider set of disciplines, to go beyond the biological constructs that he maintains impede medical advance. Tarlov's fellow authors in this volume amply demonstrate the truth of his dictum. Paul Stolley, in his panoramic concluding essay, surveys the historical epidemiology of epidemiology in America. He provides a bird's-eye view of changing patterns of disease over the last two hundred years, and of the perceptions of what counted as "leading causes," natural or not, of mortality. Together Tarlov and Stolley exemplify the several new interdisciplinary approaches that will surely be ever more important if we are to adequately address the question: Is this the way we want to die?

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Chapter 2

Health Policy and Changing Epidemiology in the United States: Chronic Disease in the Twentieth Century

DANIEL M. FOX

Beginning in the 1920s, chronic disease gradually became the priority of the American health polity: the institutions and individuals that formulate and execute our collective response to illness. Changing patterns of morbidity and mortality influenced the behavior of different elements of the polity in different ways and at different times. This chapter summarizes research I have recently undertaken in order to learn when, why, and how the various constituents of the health polity made chronic disease central to their professional activities and, therefore, their political agendas. The constituents of the polity whose history I summarize here are, primarily, hospitals, the medical profession, the biomedical research community, agencies of local, state, and the federal government, and third-party payers.

All the constituents of the polity except third-party payers made chronic disease their priority between the 1920s and the late 1940s. The third-party payers did not because the politics of health care financing in the United States linked insurance to employment, thus spreading the costs of illness over groups that were in general too small and too healthy to pay willingly the costs of managing chronic illness. I emphasize here the adaptation of the hospital, research, and public health constituencies to chronic disease. I allude to the problems of third-party payment, but reserve extended documentation of them for other publications.

I use the phrases *chronic illness* and *chronic disease* almost interchangeably because that is how the words were used in the primary sources. Different people used different definitions of the terms, but always for what turned out to have been good reasons. Thus for reasons that were pragmatic rather than etiological, some people excluded tuberculosis and mental illness when they discussed policy for chronic disease. They said that there was little reason to include them because policy for people with these diseases was already being made. Others included or excluded congenital or acquired physical impairments for similar reasons. On many occasions, however, particularly when the policy stakes were large, all these disorders were regarded as chronic. A typical all-inclusive definition from a public document published in 1947 is that chronic illness means "illness due to chronic disease or long term illness from any disease" (1). In sum, definitional ambiguity was a deliberate choice of people in the past; it was part of the way they struggled to influence policy.

The Shock of Chronic Disease, 1920–1933

In the 1920s, major figures in health affairs decided that the increasing incidence and prevalence of chronic disease should lead to fundamental changes in research, medical practice, and the policies of public health agencies. For example, two prominent New York physicians, Alfred Cohn and Ernst Boas, urged their colleagues around the country to accord more importance to chronic disease. In 1926, Cohn, a member of the Rockefeller Institute for Medical Research, realized that scientists and physicians had misunderstood the etiology of heart disease. Organic heart disease had two underlying causes, not one as most experts thought. Rheumatic fever accounted for most heart disease only among people under the age of forty. For older people the principal cause was arteriosclerosis, which was chronic and degenerative (2).

Like Cohn, Boas reached a national audience; unlike him, he devoted his career to caring for patients with chronic disease. Boas was the chief physician at Montefiore Hospital, one of the few voluntary hospitals in the country established to care for the chronically ill. He insisted that care for chronically ill patients raised major problems of social policy. The first requirement of

public policy for chronic disease should be old-age pensions, followed by sickness insurance and the replacement of the remaining public almshouses with state hospitals for chronic disease (3).

Louis Dublin, statistician of the Metropolitan Life Insurance Company, also had a major impact on how Americans, especially health professionals, perceived chronic disease. In the first decade of the century, Dublin began to analyze the causes of mortality and morbidity among Metropolitan policyholders. In 1929, Dublin concluded that mortality from chronic disease was increasing so rapidly that the idea of continuous medical progress and the belief that each disease was caused by a discrete biological agent must be re-examined. He complained that mortality after age 45 "apparently has gotten worse" in the past decade (4).

In the early 1930s Dublin decided that the incidence of cancer was reaching epidemic proportions. In 1926 he had told the American Society for the Control of Cancer that "cancer as a cause of disability and death is increasing." In 1931 he was alarmed to find an unexplained increase in cancer mortality among wage earners and their families (5).

The Massachusetts commissioner of health, George H. Bigelow, was, like Cohn, Boas, and Dublin, part of a growing national coalition of people who were insisting on the new importance of chronic disease. Bigelow was, however, ambivalent about whether chronic disease was a proper concern of public health agencies. Unlike communicable diseases, most chronic diseases were "a purely personal matter," he insisted. He wondered if states should establish departments of illness as well as of health. Despite these reservations, Bigelow organized the first comprehensive public program to diagnose, treat, and do epidemiological research on cancer (6).

In 1933, Bigelow and Herbert L. Lombard published an account of the Massachusetts cancer program which became a handbook for chronic disease surveys and control programs in the next decade. Bigelow raised but quickly set aside his reservations about the proper role of the health department, insisting that the "outstanding sickness and health problem of the present day is the control of chronic diseases of the middle aged" (7).

Bigelow and Lombard emphasized the uniqueness of the Massachusetts public health program. They had surveyed "all

the state and provincial health officers of the United States and Canada." All but three of the respondents said that "they were doing nothing about adult hygiene or chronic disease...many hoped they never would" (7).

The Origins of National Policy for Chronic Disease, 1933–1940

At the beginning of the New Deal in 1933 it was not clear whether there would be a national policy for chronic illness: commitments that combined federal and state action with a consensus about priorities among leaders of the medical, hospital, and research communities. The outlines of such a policy became apparent over the next seven years.

New federal policy changed the environment in which discussions of chronic illness occurred. Two events in 1935 marked the beginning of a conscious federal policy for chronic illness: the Social Security Act and the National Health Survey. The old-age pensions provided under the Social Security Act were, as Boas and other advocates had insisted since the 1920s, the precondition for policy to provide medical care to people with chronic disease. Because the act also forbade the payment of Old Age Assistance benefits to any "inmate of a public institution," it quickened the closure of the remaining public almshouses and the inception of the nursing home industry (8). In addition, the act authorized federal grants to the states for assistance to crippled children, needy mothers, and infants, and to assist local health departments in expanding their general health services.

The National Health Survey was conceived by officials of the United States Public Health Service (PHS) who used federal relief funds in order to create the "factual basis" for federal and state programs for the care of the chronically sick. Three million people in 737,000 households in urban communities and rural areas in eighteen states participated in the survey. The most frequently quoted finding of the survey was that 22 percent of the population had a "chronic disease, a permanent orthopedic impairment, or a serious defect of vision or of hearing" (9).

The director of the survey, George Perrott, was explicit about the pertinence of the study for policy. He was appalled that, in most states, the "control of chronic disease is rejected from the

accepted scope of public health activity." Proper policy, he believed, was "centralized supervision" to coordinate hospital and home care (9).

The Public Health Service, accorded higher priority to infectious than to chronic disease throughout the 1930s. The surgeon general, Thomas Parran, created a Division of Infectious Disease in 1937, but left responsibility for promoting concern for chronic illness with the Division of Public Health Methods. Even more telling was the report of the Division of Scientific Research — which included what was then called the National Institute of Health — for 1936: the list of studies of infectious disease was four pages long; of chronic disease, three lines (10).

Like officials of the PHS, managers of voluntary hospitals and leaders of their medical staffs accommodated only gradually, and sometimes reluctantly, to the new prominence of chronic disease. S. S. Goldwater, the most influential expert on hospitals of his generation, expressed the dominant opinion when he wrote in 1935 that "wherever a single institution was formerly used for both acute and chronic cases, the chronic service suffered." Goldwater believed, moreover, that care for the chronically ill was the "function of public institutions" (11).

Data about hospital utilization indicated, however, that voluntary hospitals were admitting increasing numbers of patients with chronic illnesses. The National Health Survey found that "with the exception of the tuberculous and the mentally diseased, the chronic sick are cared for largely in general hospitals designed for care of the acutely ill" (12). Similarly, the dean of the medical school at Syracuse University discovered in 1939 that chronic disease accounted for 90 percent of the cost of hospitalizing patients in the general medical wards of the university's hospital (13).

The founders of the hospital service plans — soon called Blue Cross — that were being created in many cities, tried to take Goldwater's advice to relegate chronic care to public institutions. In New York City, Goldwater himself chaired the committee that established the initial policies of the plan. Like similar plans elsewhere, the one in New York provided a limited hospital benefit for acute care, excluding both chronic and "quarantinable" diseases (14).

C. Rufus Rorem, a leading organizer and theorist of the Blue Cross movement, argued in 1932 that insurance against the costs

of chronic disease required risk pools that were larger than groups of employees. Rorem insisted that the limit of payment for hospitalization to 21 days by hospital service plans "protects the hospital against large expense for chronic or incurable disease." But Rorem was interested in much more than the solvency of hospitals. "Payment for treatment of chronic disease" he said, "should be made the responsibility of the entire community" (15).

Unlike Rorem, who wanted to expand the size of risk pools through voluntary action, the federal officials who designed a National Health Program in 1938 and their advisers outside government endorsed compulsory insurance. These advocates of compulsory insurance did not distinguish between care for patients with acute and chronic conditions (16).

Rorem proposed a compromise on insurance to the authors of the National Health Program on behalf of the American Hospital Association and Blue Cross plans. Under the compromise, voluntary prepayment would cover physicians' fees and ward patients in nonprofit and public hospitals. Because the new voluntary plans would include public hospitals, they would pay for treatment of chronic illness. Government agencies "might subsidize a portion of a plan for those who are unable to pay" (17).

Advocates of compulsory insurance in the federal government thwarted a compromise policy that would have extended coverage and paid some of the costs of treating chronic illness. For example, Isadore S. Falk, of the Social Security Board, took immediate and angry exception to Rorem's proposal. He ignored the vast increase in the number of people who would be entitled to hospital services at minimal public cost under Rorem's proposal. Falk claimed, moreover, that enrollment in group hospital plans had already peaked and was "levelling off in some states" (17). Like other reformers who were deeply committed to compulsory insurance, Falk opposed politically viable but less comprehensive alternatives in 1938 and in debates during and after World War II. Until the 1980s — with the exception of their reluctant support for Medicare in the 1960s — liberal advocates of national health insurance believed that half a loaf was worse than no bread at all — that compromise would make a proper program unattainable (18).

During the 1930s, leaders of medical research shifted their priority from the study of infectious organisms to the understanding of the basic biological processes that led to chronic degenerative disease. As a result, over the next decade, the tension between research in the disciplines of basic science and applied medical research was sharply reduced in the laboratories of major research institutions.

The leaders of the Rockefeller Institute for Medical Research, the most eminent institution in the field, publicized this shift in the goals of research. In 1935, Herbert Gasser, just installed as director of the institute, and John D. Rockefeller, Jr., told a press conference that although "research on infectious diseases had made remarkable advances," priorities for investigation were changing. "The time had now come," they said, to study chronic disease by more intensive "investigation of fundamental life processes at the level of the cell and its constituents" (19).

By 1935, this point of view had become the policy of the Rockefeller philanthropies. For example, in 1933, when Alan Gregg, director of the Division of Medical Sciences of the Rockefeller Foundation advocated a new program in psychiatry, he justified it with the new arguments of the coalition pressing the importance of chronic illness. He told a special meeting of the foundation's board that the diseases caused by infection, malnutrition, and hereditary defects were "increasingly within our knowledge and control." The next step, he advised, should be "special attention to the sciences underlying psychiatry" (20).

In 1938, the Rockefeller Foundation made the first of several grants to the first clinical research center dedicated to the study of chronic disease. This project was conceived by S. S. Goldwater in alliance with, among others, E. A. Boas, Alfred Cohn, and Louis Dublin. Goldwater, who was serving as commissioner of hospitals of New York City, obtained funds from the federal Public Works Administration to construct two hospitals on Welfare Island for patients with chronic diseases. He then established research units linked to divisions of the new hospitals that were staffed by two medical schools in order to "stress the broad biologic phases of chronic disease" (21). Many outstanding medical scientists worked at these units over the next decade. A notable example was James A. Shannon, who later directed the Heart Institute and then the National Institutes of Health itself in the years of its most rapid growth. Shannon served

from 1939 as cohead of the New York University Division of Welfare Hospital. In his annual report for 1941, he stated his division's goal as conducting research on "fundamental problems presented by diseases of a chronic nature" (22).

Federal research policy also began to accord higher priority to the biology underlying chronic disease in the late 1930s. Chronic disease was high on an internal PHS list of priorities for research funds appropriated in the Social Security Act. Congress created the National Cancer Institute in 1937 (23). By 1939, the new National Cancer Council had reviewed eighty-two applications and recommended sixteen awards "for the promotion of fundamental research projects" (24).

World War II and Chronic Disease, 1941–1945

As a result of events during the war, chronic disease became more important to leaders in health affairs. For example, their assumption that voluntary hospitals should only treat patients needing acute care was quickly replaced by consensus that within broadly defined geographical regions, medical care for both acute and chronic conditions should be coordinated among hierarchies of institutions that were dominated by general hospitals. Hierarchical regionalism (my phrase for this consensus) was promoted by members of a broad coalition of medical, hospital, and governmental leaders who were planning postwar health policy (25). There was no dissent in mid-1944 when E. M. Bluestone of Montefiore Hospital in an article in a major hospital journal, "The Chronic Has a Claim to Care and Cure in the Acute General Hospital," rejected the position Boas had advocated for many years (26).

Military hierarchy reinforced the hierarchy based on hospitals that was becoming national policy in civilian medicine. The armed forces used credentials in a specialty as the basis for ranking and assigning physicians. As a result, many of the general practitioners who served in the armed forces now regarded specialization as unavoidable. After the war, many of them used their veterans' benefits to acquire training in specialties, thus greatly increasing the number of physicians whose careers depended entirely on patients with chronic illness (25).

The growth of voluntary health insurance during the war put conflicting pressures on Blue Cross and commercial insurance companies. The leaders of the voluntary insurance movement wanted to increase benefits in order to prevent the enactment of national health insurance. But they also competed to offer the lowest premiums, which required them to limit coverage.

In 1944, Rufus Rorem again proposed a combination of public and insurance industry policy to increase coverage for low-income people, especially for those with chronic disease. Under Rorem's proposal, the federal government would provide a national minimum of entitlements to health and welfare services and would finance hospital construction and programs of disease prevention. Voluntary insurance plans would, in turn, expand coverage to furnish "protection against catastrophic illness among the employed workers and their dependents." Again, Rorem's plan was unacceptable to advocates of compulsory health insurance (27).

The war interrupted the redirection of medical research to emphasize the biology underlying chronic disease — but only temporarily. The Committee on Medical Research of the federal Office of Scientific Research and Development (OSRD) awarded several thousand contracts to medical scientists to investigate war-related problems. Shannon's group on Welfare Island, for example, set aside its research on chronic disease to study malaria. In 1943 and 1944, however, PHS officials obtained authority to make grants for purposes other than research on cancer. But the Bureau of the Budget (BOB) would not ask Congress to fund the grant program. Bypassing BOB, the NIH awarded grants to selected OSRD contractors using OSRD funds to make the initial awards. Thus projects begun as wartime procurement of information about trauma and infection became the basis of a postwar research program of investigator-initiated grants focused on the biology of chronic disease (24).

New strategies for private funding of research on chronic disease emerged during and immediately after the war. In 1944 Albert and Mary Lasker awarded a grant to the American Cancer Society to conduct a fund-raising campaign with the stipulation that 25 percent of the funds collected would be spent for research (28). Immediately after the war, the Laskers shifted their emphasis to promoting the new grant program of the NIH.

The private and public sectors converged on a research strategy focused on chronic disease.

Proponents of the new research strategy would focus on one chronic disease, or cluster of diseases, at a time in order to engage public and congressional attention. The programs of both the National Cancer Institute and the American Cancer Society became models for an incremental, but coherent, approach to the polities of funding research. Opponents of this approach, especially liberals who wanted more spending for health services, complained about a "disease of the month" strategy. They missed the point: a bipartisan coalition of people who saw themselves as political moderates had been created to promote research on chronic disease as a necessary complement to any public or private health insurance schemes. In the absence of a similar coalition for financing health services, national chronic disease policy became primarily research policy.

Growth and Frustration: Chronic Disease Policy, 1945–1960

Two major problems raised by the increasing burden of chronic disease remained unresolved in the late 1940s. The most pressing of these problems was the paying of the costs of medical and institutional care. Insurers hesitated to raise the premiums paid by healthy employed people by covering long-term care for chronic illness and permitting workers to retain benefits after they retired. In the 1930s they had excluded chronic illness and contagious disease. Now they claimed to be blind to diagnosis (except for mental illness) and restricted coverage for chronic disease by placing limits on the duration of coverage for hospitalization. Later, when coverage was extended to nursing homes and home health care, its duration would also be limited.

The other problem with no apparent solution was that physicians preferred to provide acute care rather than to manage cases of chronic illness. Physicians and their patients prized intervention. Boas and his few allies had failed to change the emphasis of medical training from acute to chronic care. Under a fee-for-service payment system, moreover, physicians were more highly compensated for performing procedures than for spending time with patients.

Nevertheless, chronic disease became the dominant concern of federal health policy in the decade and a half after the war. Leonard Scheele, who succeeded Parran as surgeon general in 1947, accorded chronic disease higher priority within the PHS. Congress established the Heart Institute in 1948. A year later, Scheele created the Division of Chronic Disease in the Bureau of State Services. Scheele insisted that chronic disease was the fundamental concern of health policy in hundreds of speeches and in testimony to Congress (29). Moreover, the vast expansion of health benefits for veterans, especially for illnesses not directly connected with military service, made the federal government the largest provider in the country of care for the chronically ill. Veterans' Administration programs removed considerable potential pressure to provide care for chronic illness from civilian institutions and voluntary health insurance.

States took more responsibility for chronic disease in the 1940s. In more than half of them, health departments were now planning and regulating the institutions that provided care, including chronic care. State planning officials worked with broad coalitions of medical, hospital, business, and labor leaders who advocated the need for more facilities to treat patients with chronic disease as an aspect of hierarchical regionalism. In New York, to take one unexceptional example, a commission proposed in 1947 the "establishment of a chronic disease hospital center in each hospital region in the state . . . in conjunction with a general hospital and a medical school." Reflecting the new national consensus, the commission insisted that the "bulk of hospital care for the chronically ill should be provided in wings, wards or floors of general hospitals or in contiguous buildings" (30).

State governments were, moreover, assuming new responsibilities for medical education. In the decade after the war, state spending for the capital and operating expenses of state university medical schools and their teaching hospitals increased by more than 400 percent. Much of the research money granted by NIH to study the biology underlying chronic disease was spent in facilities built by states and often staffed by scientists and technicians paid with state funds (31).

The presidential Commission on the Health Needs of the Nation summarized the consensus on health policy a month before Harry S. Truman left office. The commission called for a "bold attack" on chronic disease, which was no longer a "hope-

less affair." The nation needed more hospitals, health professionals, and research to address chronic disease. Voluntary health insurance, with suitably expanded coverage, would suffice for everyone except the elderly and the poor (31,32).

A new constituency for rehabilitation medicine that had emerged during the war and then grown rapidly also promoted concern for chronic illness. Rehabilitation, which promised to reduce or eliminate dependency, was attractive to a Republican national administration looking for alternatives to New Deal and Fair Deal entitlement programs. Mary E. Switzer, the federal health official responsible for rehabilitation policy, wrote privately in 1954 that she and her colleagues had the "complete and unqualified commitment of the President and the national government to pursue rehabilitation as a major part of our national social policy" (33).

Federal spending for programs related to chronic disease grew in the 1950s because the president, leading Cabinet members, and the chairmen of important congressional committees had the same goals as the leaders of the health coalitions in the states. The Hospital Survey and Construction (Hill-Burton) Act was amended in 1954 to authorize subsidies to construct nursing homes and rehabilitation facilities provided that they were closely affiliated with general hospitals. Between 1948, when the first state plans were submitted under the Hill-Burton Act, and 1956 the number of acceptable chronic disease beds in general hospitals increased by 48 percent. In 1956, Congress created a disability insurance program under Social Security. The NIH budget increased substantially as a result of support from both the Congress and fiscally conservative secretaries of the Treasury and Health, Education and Welfare, who had served on the boards of university hospitals. In 1956, the first federal grants were authorized for medical schools, to assist them in constructing facilities for research (34).

When a Commission on Chronic Illness issued its reports in 1956 and 1957, a great deal of what it had been established to promote had already become the national consensus. The commission was organized in 1946 as a joint effort of the American Hospital Association, the American Medical Association, American Public Health Association, and the American Public Welfare Association. For the next decade it was the vehicle through which the leaders of these organizations influenced national

policy. The final report of the commission analyzed the achievements of that policy and the gaps in it (35).

The problem of financing care for the chronically ill remained unsolved. Comprehensive national health insurance had been removed from the agenda of practical politics after the bitter debates over it in the administrations of Franklin D. Roosevelt and Harry S. Truman. Although more than a hundred million Americans had voluntary hospital insurance, most of them were not covered for medical or institutional care associated with illnesses of long duration.

Officials of organized labor were in a difficult position with regard to financing care for chronic illness. The labor movement still wanted everyone to have comprehensive coverage under national health insurance. Until that distant event, the logic of voluntary insurance would require each group of employees to look out for itself (36).

Voluntary insurance was changing, however, although slowly and, in the opinion of many observers, insufficiently. An academic expert on the organization of health services had argued in 1948 that adequate coverage for chronic illness would never be achieved under voluntary insurance; it was, he said, a "natural limitation" (37).

The limit turned out to be political rather than natural. In 1953, Rufus Rorem claimed that "coverage for chronic illness" was one of seven standards for measuring the comparative adequacy of the commercial plans that were challenging Blue Cross (38). The same year, the Blue Cross Commission retained the nation's most prominent tax attorney to argue against a proposal by the federal Treasury to include in employees' taxable income amounts paid by employers for premiums for prepayment plans and hospital insurance. In the memorandum he submitted to the Treasury, Randolph Paul used data published by Louis Dublin to argue that premiums for health insurance should be excluded from income for purposes of taxation because, among other reasons, of the vast increase in chronic disease, the costs of which his clients were helping make bearable (39). In the early fifties, moreover, commercial insurers introduced "major-medical-expense" insurance to "provide adequate financial protection against the cost of really serious and overwhelming sickness or accident" (40).

By the late 1950s, a new coalition had formed on behalf of federal financing for medical care for the elderly, and grants to the states to provide care to recipients of federally assisted welfare programs. Hospital managers were eager to be reimbursed for the care of the elderly and the poor. Unions were eager to solve, at public expense, the problem of medical care for retired workers. Many medical specialists, breaking with the American Medical Association (whose membership and power were declining), now believed that federally insured medical care for the elderly would provide hospitals, and especially large teaching institutions, with badly needed revenue. Moreover, older Americans were organizing to support federal hospital insurance (41).

This new coalition resembled the alliance that had been providing increasing federal support for research on chronic disease since the end of World War II. The coalition consisted mainly of moderates of both political parties, who — as in the case of research — welcomed support from liberals and a few conservatives. American social advocacy is usually a debate between Right and Left: social policy, however, is made by the center.

The First National Policy for the Costs of Chronic Disease, 1960–1972

In the early 1960s, the coalitions supporting more research, public services, and manpower for chronic disease were more successful than the new alliance for the financing of health. The NIH budget continued to grow, although congressional committees now demanded evidence of the productivity of investigator-initiated research. In 1963 the Community Mental Health Act provided federal support for programs of deinstitutionalization managed by the states. Medical school lobbyists had insisted since the late 1940s that there was a growing shortage of health professionals as a result of the rising demand for care, especially care for chronic illness. In 1963, the Health Professions Education Act made federal funds directly available for medical education for the first time. In December 1964, a commission recommended to President Lyndon B. Johnson a national program to "conquer heart disease, cancer and stroke" by disseminating advanced knowledge and technology from academic

medical centers to their geographical regions. This proposal was implemented in 1965 as the Regional Medical Program (42).

The authors of the 1965 amendments to the Social Security Act that became known as Medicare and Medicaid claimed that their purpose was to meet the needs of the elderly and the poor for acute care. They presented Medicare as a program to cover acute hospitalization and substitutes for it because they feared losing crucial support in Congress, especially in the House Committee on Ways and Means, if it appeared to be uncontrollably expensive. Nevertheless, Medicare, under the recently devised category of extended care, covered more nursing home services and home health care than any voluntary health insurance program (48).

Medicaid was conceived as a program to provide basic medical services for recipients of public assistance and for people whom the states would define as medically needy. Within a few years, Medicaid was providing enormous benefits to people with chronic illness who became "medically needy" because they exhausted their savings by paying for health services.

In the late 1960s and 1970s, new policies seemed to signal the gradual expansion of policy for chronic disease. A committee appointed in 1967 by the Bureau of the Budget began the process that led, in 1972, to coverage of treatment for end-stage renal disease under Medicare. In 1969, President Richard M. Nixon declared war on cancer. Until the late 1970s, legislation for national health insurance was introduced in each session of Congress: many people said it was "imminent."

By the early 1970s, Americans had considerable third-party coverage for chronic disease. For the elderly, Medicare, supplemental insurance, and Medicaid, paid for most of the care required for illnesses of long duration. After 1972, beneficiaries of Social Security Disability Insurance were entitled to Medicare after a waiting period. Recipients of federal aid to families with dependent children and to the blind, and state disability programs were automatically eligible for Medicaid. Most employed workers had health insurance that covered some of the costs of chronic illness.

Critics emphasized the limits of this coverage and the gaps in it. Fiscal intermediaries often interpreted the Medicare regulations for nursing home and home health care in ways that withdrew services from people who still needed them. The process

by which people achieved medical neediness—called "spending down" — was demeaning. Many workers had inadequate voluntary health insurance or none at all.

Nevertheless, there was widespread support for a new principle of health policy. Access to medical services no longer depended on personal wealth or employment or, in their absence, on public or private charity. Old age, disability, and poverty now triggered entitlement.

Toward the Present: Chronic Disease and Cost Containment

The coalition that had sustained the innovations in health policy in the 1960s and early 1970s almost immediately began to erode. The rising cost of medical services became a pressing concern in an economy disturbed by both inflation and recession. The comprehensive coverage provided by Medicare and many voluntary insurance policies was itself a source of rising demand for medical care and thus of inflationary pressure on the price of health services. The supply of services — beds, equipment, specialists — was growing in response to generous third-party payments. By the late 1970s cost containment was the goal of policy to finance medical services.

The consensus that chronic illness was the central concern of health policy remained unchanged. Chronic disease continued to have the highest priority in medical research. The nursing home and home health care industries, stimulated by Medicare, Medicaid, and private insurance dollars, grew enormously, creating severe problems of regulation for the federal government and the states.

The centrality of chronic disease in health policy survived the policies of the Reagan administration: sizable cuts in the budgets of categorical and entitlement programs, severe regulatory constraints on Medicare, and the devolution of responsibilities to the states (43). In 1988, a new bipartisan coalition of moderates in Congress, with broad public support, amended Medicare to provide coverage for catastrophic costs of illness. The new legislation removed, if somewhat ambiguously, the requirement that coverage of nursing home and home health care could only follow a period of hospitalization. This change reversed the

formal emphasis on acute care of half a century of private and public health insurance in the United States. Chronic illness had gradually become the most costly claim on all health insurance. Now, under Medicare, managing care for people with chronic illness could take precedence over paying for acute episodes and their aftermath.

The contemporary perception of chronic illness in American health policy is a result of sixty years of history. Analytical and promotional activities begun by a few people in the 1920s and 1930s stimulated changes in the priorities of public agencies, hospitals, and the research community in the decade and a half after World War II. The coalitions that created state and federal health policy in the 1940s and 1950s made possible the national legislation of the 1960s. The major dilemma in policy for chronic disease — paying for care — was only partially resolved by the innovations of the 1960s and early 1970s.

The continuing inability to create an acceptable consensus on financing care for diseases of long duration (or those like AIDS, in which high costs are compressed into a brief time), remains the major unsolved problem of health policy. For almost six decades Americans have, hesitantly and with considerable political turmoil, created a mixture of public and private policies to pay the costs of managing chronic disease. Many critics have insisted that these policies could be made more comprehensive, equitable, and efficient. In the past, increases in the coverage, equity, and efficiency of health services occurred only when they were endorsed by a bipartisan coalition of moderates — a consensus of the center — that was eager to address the politics of allocation.

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An earlier version of this chapter was commissioned by the Hastings Center and presented at a meeting in Los Angeles in September 1986. A revision of that paper was presented at Rutgers University later that year. Papers that expand on the themes addressed here are currently in progress or in press. I am grateful to many critics, but particularly to Gerald Grob, Ruth Hanft, David Mechanic and Irving Kenneth Zola for their comments on earlier drafts of this chapter.

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PART II

Cardiovascular Disease

Chapter 3

Experimental and Clinical Atherosclerosis: Their Experimental Reversal

STANLEY J. DUDRICK, PHILLIP R. ADAMS, DeANN M. ENGLERT and ANDREW S. FESTE

The association of diet and nutrition with hypercholesterolemia and with the development of atherosclerosis was discovered serendipitously almost 80 years ago (1). Subsequently, the specific role of cholesterol in the etiology and pathogenesis of atherosclerosis has been a subject of considerable debate by clinicians and investigators (2). An elevated total plasma cholesterol concentration is certainly not the sole cause of, or the only contributing factor to, coronary heart disease secondary to atherosclerosis. However, it appears that reducing elevated total plasma cholesterol levels can significantly decrease the risk, or is associated with a decreased risk, of myocardial infarction secondary to atherosclerotic coronary heart disease (3,4,5,6,7,8).

As the clinical applications of total parenteral nutrition (TPN) have been explored and expanded during the past twenty years, it has been documented on many occasions that total plasma cholesterol concentrations decline, especially in animals, infants, critically ill malnourished adults, and long term home TPN patients in whom fat emulsions are used sparingly or not at all (9). Early attempts at the Hospital of the University of Pennsylvania to correlate short term TPN-induced hypocholesterolemia with regression of atherosclerosis in patients with severe peripheral vascular disease were unsuccessful (9). However, it was recognized that the technique of total parenteral nutrition afforded a unique opportunity to provide nutrient substrates to animals,

patients, and human subjects in a defined qualitative and quantitative manner heretofore impossible to achieve by any other means. Additionally, it allowed investigators to study and to correlate the effects of the individual nutrient substrates in different combinations and dosages with plasma cholesterol levels and with the development and regression of atherosclerosis in animals and humans. Accordingly, a series of investigations was designed to: 1) develop a relevant and reliable animal model of dietary-induced atherosclerosis in rabbits; 2) strictly control nutrient substrate administration in rabbits and humans to determine the maximum dietary potential for reducing plasma cholesterol concentrations while maintaining adequate nutrition; 3) modify existing intravenous nutrient substrate mixtures to maximize their cholesterol reducing effects; 4) determine whether these diets, either directly or secondary to induced hypocholesterolemia could arrest and/or induce regression of atherosclerosis; and 5) determine whether improved blood flow to vital tissues and organs and improved cardiovascular function would thereby result.

Animal Experiments

In a series of preliminary investigations, an experimental atherosclerosis rabbit model was developed over a period of several years by modifying the oral diets of equal numbers of male and female New Zealand albino rabbits in groups of 40 animals. While systematically and logically altering the fat, cholesterol, and fiber in the diet, a specific formulation evolved that consistently and reliably induced atherosclerotic lesions. The resultant plaque simulated the composition, distribution, extent and severity, gross morphology and histologic characteristics, primary pathophysiology, secondary complications, and clinical manifestations of atherosclerosis comparable to that commonly observed and documented in humans.

Initially, all animals were examined by the veterinary staff and underwent a period of quarantine and observation. During this time they were fed exclusively a diet of high fiber Purina Labchow #5326. This formulation was also used to feed the control animals later throughout the experimental period. To induce dietary hypercholesterolemia, 80 grams of peanut oil and 20

TABLE 3.1. Atherogenic Oral Rabbit Diet*

Basic formula
High fiber Purina Labchow 5326**
14.5% protein
1.7% fat
55 ppm cholesterol
42.4% nitrogen-free extract
8.9% ash
Water
22.5% crude fiber
40.9% neutral detergent fiber (cellulose, lignin, hemicellulose)
24.6% acid detergent fiber (cellulose, lignin)
Additives per kilogram of basic formula
900 g fiber
80 g peanut oil
20 g crystalline cholesterol

*Teklad T.D. 82135, Teklad, Inc., Madison, WI.
**Purina Labchow 5326, Purina Mills, Inc., St. Louis, MO.

grams of crystalline cholesterol were added per kilogram of the basic oral diet, and an additional 900 grams of fiber were necessarily added to the basic diet to promote normal bowel and colonic action and to avoid obstipation. This atherogenic formulation was subsequently manufactured as Tecklad TD #82135 which was used with uniform success to produce hypercholesterolemia and atherosclerosis in the subsequent experimental series of animals (table 3.1).

During the development of the hypercholesterolemic atherogenic rabbit model, it was possible to maintain total plasma cholesterol concentrations at virtually any desired level between 50–6,000 mg/dL by varying the proportion of standard high fiber Purina Labchow #5326 and Tecklad TD #82135 in the daily ration while providing sufficient nutrients to maintain stable body weight. When plasma cholesterol levels were maintained in the 300 – 500 mg/dL range for as long as six months, the atherosclerotic lesions were small, thin, scanty, and more sclerotic than atheromatous. As the plasma cholesterol concentrations were subsequently increased by 500 mg/dL increments to the 5,000 mg/dL level, the arterial lesions developed more rapidly, increased in size and distribution, became less sclerotic and more atheromatous, and resulted in higher morbidity and mor-

tality. As a result of these preliminary studies, it was determined that the optimal condition for our purposes was to maintain plasma cholesterol levels between 1,000–2,000 mg/dL without increasing body weight. This was accomplished without untoward hepatobiliary, gastrointestinal, or other complications. The severity of atherosclerosis in the major vasculature could be estimated by observing the gross appearance and extent of atheromatous deposits in the small radial blood vessels of the iris of the rabbits. After six to twenty weeks of maintaining hypercholesterolemia in these animals, significant atherosclerosis routinely involved 30 percent to 90 percent of the surface area of the great vessels respectively, and the lesions were histologically indistinguishable from those that commonly occur in humans. Indeed, by six months, some animals had documented myocardial, cerebral vascular or mesenteric infarctions, and mesenteric and/or peripheral vascular occlusions secondary to severe atherosclerosis involving more than 95 percent of the surface of the great vessels and major tributaries.

A large series of experiments was then carried out in 1,600 New Zealand albino male adult rabbits in sets of 40 animals in which total plasma cholesterol levels were maintained at approximately 1,000 mg/dL in all rabbits for 4.5 months. This time period was selected because of observations made in the preliminary animal experiments which indicated that approximately 90 percent of the surface area of the aorta and its major branches would be involved with complex atherosclerotic lesions and that animals maintained on the hypercholesterolemic/atherogenic diet would succumb to the disease and its complications in seven to eight months. Moreover, this would allow a period of 1½–3 months for therapeutic dietary manipulations to arrest, or begin to reverse, the atherosclerosis, during which the animals that continued receiving the hypercholesterolemic/atherogenic diet would still be alive for elective comparison with their experimentally treated counterparts. Only male rabbits were used in these experiments because housing both sexes in the same quarters stimulated behavioral aberrations which interfered with the conduct of the studies.

At 4.5 months, ten rabbits in sets of 40 were selected randomly, killed humanely, and autopsied thoroughly in order to delineate and document the gross and histologic extent and character of the disease in these animals as baseline determinations.

The remaining 30 rabbits in each of the initial sets of 40 were assigned randomly to one of three continuing study groups. Group I of each set consisted of ten randomly selected animals that continued receiving the hypercholesterolemic/atherogenic dietary regimen for at least an additional six weeks. Group II consisted of ten randomly selected animals that received a standardized rabbit diet (Purina Labchow #5326) for at least an additional six weeks. The remaining ten animals comprising Group III were infused continuously for six weeks with one of several fat-free TPN solutions, which differed in their amino acid composition (table 3.2), via a central venous catheter inserted by a cut-down on the external jugular vein and advanced so that its tip was positioned in the superior vena cava. The proximal end of the catheter was directed subcutaneously to emerge in the posterior upper thoracic midline where it could be attached to a support apparatus and a swiveled administration set for continuous infusion by pump in an unrestrained manner.

The fat-free nutrient solutions were administered continuously by pump over 24 hours daily. Each solution was formulated to provide 1.5 grams of amino acids and 35 calories as dextrose per kilogram body weight daily together with all essential vitamins, minerals, and trace elements to achieve balanced nutrition. All of the animals, which weighed between 2.0 and 2.5 kg (Avg = 2.2 kg), appeared to thrive on this solution and either maintained or slightly increased their body weight during the six-week experimental period. The mortality rate for the animals in the intravenous infusion groups throughout the study was less than 5 percent, and all deaths were due to technical problems or accidents related to the infusion technique rather than secondary to any metabolic or nutritional disorders.

Blood samples were obtained weekly throughout the six-month study period in all three groups of animals to monitor lipid profiles and standard biochemical and hematologic indices. Plasma and urine amino acid profiles were obtained monthly, and all animals underwent comprehensive gross and histologic examination at the end of the six-week study.

In the Group I rabbits, complex atherosclerotic lesions consistently involved 85 percent to 95 percent of the aorta from its origin above the aortic valve to the bifurcation of the common iliac arteries; the lesions resembled the pattern of superficial plaque and/or arterial wall distribution characteristic of complex

TABLE 3.2. Composition of Intravenous Amino Acid Solutions

Amino Acid	FreAmine III 8.5%*	Travasol 8.5%**	Aminosyn 10%†	FreAmine III 10%*	Travasol 10%**	Novamine 11.4%‡	Atheromine 10.3%**
Isoleucine	6.53	4.09	6.61	6.51	5.46	4.83	4.0–10.0
Leucine	8.53	5.30	8.64	8.59	6.65	6.70	5.0–10.0
Lysine	4.93	3.56	4.75	4.92	3.79	5.48	4.5–6.5
Methionine	4.38	4.36	3.23	4.40	3.20	4.25	3.5–5.5
Phenylalanine	4.21	4.19	3.20	4.18	4.03	5.30	4.5–7.5
Threonine	4.15	3.95	5.27	4.16	4.21	5.33	2.0–3.5
Tryptophan	0.92	0.98	0.88	0.91	1.05	1.03	1.0–2.5
Valine	6.94	4.39	8.22	6.97	5.90	6.92	4.0–9.0
Alanine	9.75	26.01	17.25	9.83	27.64	19.78	7.0–16.0
Arginine	5.57	5.51	5.59	5.57	5.94	5.90	9.0–18.0
Histidine	1.69	2.38	1.75	1.68	2.78	3.66	1.5–3.5
Proline	11.98	4.09	9.00	12.04	7.05	6.57	4.5–8.5
Serine	6.90	0.00	4.81	6.94	5.67	4.76	2.5–6.5
Tyrosine	0.00	0.27	0.32	0.00	0.29	0.20	0.0–1.0
Glycine	22.98	30.92	20.50	23.05	16.35	11.68	3.0–8.0
Glutamic acid	0.00	0.00	0.00	0.00	0.00	4.30	3.5–5.5
Aspartic acid	0.00	0.00	0.00	0.00	0.00	2.75	2.0–4.0
Cysteine	0.24	0.00	0.00	0.25	0.00	0.56	0.0–1.0

*Kendall-McGaw Laboratories, Irvine, CA.
**Baxter Healthcare Corp., Deerfield, IL.
†Abbot Laboratories, North Chicago, IL.
‡Cutter Laboratories, Emeryville, CA.

atherosclerotic lesions observed in humans. Nonlethal myocardial infarctions, cerebral vascular infarctions, intestinal ischemia and infarction, and ischemia and infarction of the hind extremities were evident in several animals in this group.

The rabbits in Group II did not exhibit evidence of significant progression or regression of atherosclerosis when compared with the initial ten rabbits in the 4.5-month hypercholesterolemic/atherogenic control group, despite the fact that the plasma cholesterol concentrations returned to normal levels within seven to ten days in these animals and remained in the normal range until the end of the study period. A few of these animals manifested signs of having sustained small, nonlethal myocardial infarctions, but no evidence of other organ ischemia or infarction was found.

In the Group III rabbits receiving the various intravenous nutrient formulations, the extent, degree and severity of the atherosclerosis either was unchanged during the infusion of some solutions or underwent dramatic regressions with up to 90 percent to 95 percent clearing of the surface area of the great vessels and major tributaries. These changes occurred by the end of the six-week study period in those animals receiving the most effective anticholesterol formulation.

In the first six sets of 40 rabbits (n = 240), the Group III animals received one of six commercially available amino acid solutions (table 3.2) per set. Subsequently, this procedure was repeated in an additional 12 sets (n = 480) of rabbits so that at least 30 of the 720 animals studied in this series of experiments received each of the six standard amino acid solutions as the source of protein substrate. After six weeks of intravenous infusion periods using the six standard amino acid solutions, reversal of atherosclerotic lesions varied from none, to minimally detectable, to 5 percent to 10 percent regression in the various groups. No statistically significant advantage was noted for any of the six commercially available amino acid solutions. By correlating the plasma and urine amino acid concentrations with plasma cholesterol levels in this large group of animals, indicated changes in the dosages and ratios of the individual amino acids were made sequentially in all subsequent sets of rabbits (n = 160) studied in order to maximize the effects of the solution. As a result of these studies and the multiple amino acid manipulations in the intravenous regimen, we evolved an amino acid formulation that consistently

induced 90 percent to 95 percent regression of the dietary induced atherosclerosis in the rabbits within six weeks.

In the course of altering the amino acid composition and concentrations of the individual amino acids in response to the weekly plasma and urine amino acid concentrations and plasma cholesterol levels, the daily intravenous amino acid ration was increased from 1.5 to 1.7 grams per kilogram body weight. Concomitantly, glutamic acid and aspartic acid were added to the formulation. The final amino acid formulation that evolved as a result of these studies formed the basis for the most effective solution in reducing plasma cholesterol levels and inducing regression of atherosclerosis. Table 3.2 compares the formulation (Atheromine) with the six commercially available amino acid solutions.

The preclinical animal investigations demonstrated consistent atherosclerotic plaque regression as a result of the administration of the fat-free TPN regimen containing the specially formulated amino acid ration. No biochemical, nutritional, hematologic, clinical, or gross or microscopic abnormalities, complications, or toxicities were noted in any of the animals who received the experimentally derived cholesterol lowering amino acid solution. These studies formed the basis and justification for progressing to subsequent pilot and preliminary investigations in human subjects and patients.

Clinical Experiments: Pilot Study

A 40-year-old Caucasian man with Type IIB hyperlipidemia had an acute anterior myocardial infarction at age 32. After recovery from this episode, he was treated with anticoagulants, clofibrate, and cholestyramine. His total plasma cholesterol levels ranged between 500–800 mg/dL, and his total triglyceride levels ranged from 800–1,000 mg/dL. Management at a regional lipid research clinic consisting of a low cholesterol, low fat, 1,400-calorie diet and cholestyramine administration maintained his plasma cholesterol levels between 450–560 mg/dL. Cardiac catheterization in April 1984 showed 100 percent occlusion of his right coronary artery and diffuse atherosclerotic lesions present in the left anterior descending and circumflex coronary arteries.

Because of progressively increasing severity and frequency of exercise-induced angina pectoris, severe lower extremity claudication after walking one block, daily episodes of dizziness and syncope, and intermittent numbness in his extremities related to poor or absent pulses in his neck, arms and legs, he desperately requested our experimental anticholesterol therapy. He was not considered a candidate for coronary bypass surgery because of the diffuse nature of his disease. After our basic laboratory and animal studies had been explained to him together with complete information regarding the proposed pilot study, he agreed to undergo a six-month period of intravenous anticholesterol therapy beginning May 1985. A percutaneous subclavian central venous feeding catheter was inserted into the patient's superior vena cava, and a continuous infusion of the modified TPN solution that had ultimately evolved during the rabbit studies was begun after obtaining baseline biochemical, nutritional, and hematologic studies. The patient initially received 1.35 grams of amino acids per kilogram body weight for a total ration of 95 grams of amino acids in the ratios present in the final rabbit formula. Simultaneously, he received 35 calories per kilogram body weight as dextrose together with his daily requirements of vitamins, minerals and trace elements. He was allowed absolutely nothing by mouth but water.

The patient received no fat or cholesterol, and all nonprotein caloric requirements were provided as dextrose. Because he was approximately four to five kilograms above his calculated ideal body weight, his formula for the first several weeks was slightly hypocaloric until he achieved his ideal body weight. Biochemical, metabolic and hematologic studies were obtained serially throughout the six-month treatment and clinical study.

Within a few days of initiating the anticholesterol therapy, the patient ceased experiencing angina pectoris, dizziness and syncope. During the course of the six months of study and therapy, his peripheral pulses and perfusion improved greatly. Originally, three of the eight pulses usually present in the extremities were palpable at a strength of 2/4 graded on the standard clinical scale, whereas the remaining five peripheral pulses were not palpable at all. At the end of the therapy, seven of the eight pulses were palpable and graded from 2/4 to 4/4. The Doppler blood flow to his left leg increased approximately 250 percent and to his right leg increased approximately 300 percent, and

the episodic numbness in his hands and feet which he had experienced prior to the therapy disappeared.

After four weeks of anticholesterol therapy, the patient's general health, strength, activity, and feeling of well-being improved to the degree that he began a graduated monitored treadmill exercise program at his request. During the fifth week of therapy, he walked one mile a day on the treadmill at one mile per hour; and by the eighth week of therapy he was walking 3.5–4 miles a day at 3.5 miles per hour without pain or claudication in his legs and without angina pectoris. During the ninth week of therapy, he began to play 18 holes of golf several times a week, scoring in the seventies despite the handicap of having to wear the continuous intravenous infusion apparatus.

Throughout the course of the anticholesterol infusion therapy, frequent plasma and urine amino acid concentrations were determined and correlated with his plasma cholesterol levels. The initial formulation was modified in response to these studies on several occasions to induce maximum reductions in plasma cholesterol levels. After ten days of therapy, the branched chain amino acids, isoleucine, leucine and valine, were increased. At five weeks, phenylalanine was increased and glycine was decreased. At two months, alanine was decreased while glutamic acid and aspartic acid were increased. During the fifteenth week, proline and serine were decreased. Finally, during the fifth month arginine was increased and histidine was decreased.

Within two days, the plasma total cholesterol concentration dropped sharply from the initial 508 mg/dL to 450 mg/dL. By the eighth day of therapy, the plasma cholesterol concentration dropped to 370 mg/dL; by the tenth day, the concentration dropped further to 220 mg/dL which represented a 57 percent reduction from the initial level.

On the sixtieth day of therapy, 500 ml of 10 percent soybean oil emulsion (10 percent Intralipid) were infused into the patient over six hours, and the plasma cholesterol concentration rose promptly and sharply more than 100 mg/dL and remained over 300 mg/dL for one month thereafter. On the 90th day of therapy, the plasma cholesterol concentration was 300 mg/dL, and a single 500 ml dose of 20 percent soybean oil emulsion (20 percent Intralipid) was given intravenously with a subsequent rise in the plasma cholesterol level to 345 mg/dL indicating the potential

deleterious effect on the plasma cholesterol level of infusions of relatively small amounts of lipids.

Quantitative coronary angiography performed after the six-month period of anticholesterol therapy revealed improved run-off in the previously occluded right coronary artery and increased diameters, cross sectional areas, and flow reserves in the branches of the left coronary artery with the development of increased collateral coronary artery circulation, myocardial perfusion and left ventricular function. Computerized quantitative evaluations of pre-and post-therapy coronary angiograms revealed regression of coronary atherosclerotic lesions. For example, the diameter of the circumflex branch of the left coronary artery increased from 1.19 mm before therapy to 1.30 mm after therapy with a subsequent increase in cross-sectional area from 1.12 mm before therapy to 1.27 mm after therapy. The effects of these seemingly small changes in luminal diameter are significant considering that the blood flow through a cylinder such as an artery is directly proportional to the fourth power of the radius of the vessel. The calculated coronary flow reserve increased from 3.6 to 4.2 (top normal value = 5), consistent with the disappearance of his angina pectoris.

At the termination of the intravenous therapy, the patient resumed oral feeding with a restriction of dietary cholesterol to 100 mg daily. He was also instructed to limit his caloric intake to a ration that would maintain his ideal body weight while ingesting only 20 percent to 30 percent of his calories as fat.

In addition to the demonstration of atherosclerotic plaque regression and increased arterial blood flow through multiple previously compromised coronary arteries, additional evidence of improved bodily functions was manifested by the patient's ability to play 18 holes of golf virtually daily and to gain temporary employment as a carpenter performing physical labor with a housing construction firm. He has remained asymptomatic and physically active since his therapy was initiated, and he has recently returned to his original gainful employment as a computer systems analyst. To date, the patient is approximately 38 months postinitiation of his anticholesterol therapy and 32 months postcompletion of his therapy.

The final solution formulation which evolved during the course of the six-month pilot study in this patient was subsequently infused into an additional ten rabbits as part of a supplementary

group of 40 rabbits studied in an otherwise identical manner. The regression of atherosclerosis documented in this supplementary group of ten rabbits was the most effective, consistent and complete of any of the animals studied, and ranged from 98 percent to 99 percent.

Clinical Experiments: Home TPN Patient Trial

To determine the extent of the increased effectiveness of the derived anticholesterol amino acid formulation in lowering plasma cholesterol when compared with the standard amino acid formulations used in home TPN, 30 patients were studied who had been receiving one of the six commercially available amino acid solutions listed in table 3.2 for four months to nine years. The anticholesterol solution which had evolved during the patient pilot study was substituted for the usual amino acid solution in each of the 30 patients for seven days while monitoring plasma cholesterol levels daily. Prompt reductions in plasma cholesterol concentrations by 40 percent to 65 percent occurred in all patients regardless of the initial baseline values or the usual amino acid solutions that had been infused previously during their standard home TPN regimens.

In one patient in whom the baseline cholesterol level was 168 mg/dL, a 58 percent drop in plasma cholesterol to 70 mg/dL occurred in seven days. Even more dramatic and remarkable was a 65 percent reduction in plasma cholesterol from an already low value of 85 mg/dL to 30 mg/dL in seven days.

This additional corroborative evidence for the effectiveness of the intravenous technique and the amino acid composition of the solution for lowering plasma cholesterol is highly significant, not only because of the rapidity and order of magnitude of the reductions in plasma cholesterol levels documented in these patients, but also because the positive response rate was 100 percent. All of these patients had been receiving long term intravenous infusions of conventional TPN substrates, and no changes were made in their formulas except for the isonitrogenous substitution of the anticholesterol amino acid solution (Atheromine) for their usual amino acid solution. The patients were unable to describe any untoward subjective or objective clinical signs or symptoms, nor were any adverse biochemical, nutri-

tional, or hematologic effects documented during the course, or after cessation, of the one-week trial infusion.

These short term preliminary data suggest that the mechanism of action of the anticholesterol amino acid solution is probably the result of an active biochemical process rather than a result of severe restriction of dietary cholesterol, cholesterol precursors, and other lipids, since all of these patients had been severely restricted in this regard for several months to years prior to the one-week trial change in their amino acid substrate solution.

Preliminary Clinical Studies

The human anticholesterol amino acid formulation which evolved during the pilot study was used as the amino acid source for TPN solutions that were infused into 12 volunteer study patients who had severe cardiovascular disease. Minor modifications were made in the initial anticholesterol amino acid formulations in accordance with plasma and urine amino acid levels and plasma cholesterol concentrations in each individual patient.

Figures 3.1–3.5 are graphic representations of the concentrations of total plasma cholesterol and triglycerides, VLDL lipids, LDL lipids, HDL lipids, and Apoproteins A1 and B100 during the 90-day periods of the intravenous anticholesterol therapy in the 12 patients. All patients have improved clinically as manifested by improved cardiovascular function, (standard stress tests, thallium stress tests, Doppler flow measurements), improved levels of physical activity, decreased or absent symptoms (angina pectoris, claudication, dizziness, syncope), increased strength and sense of well being, and ability to reduce significantly or omit the dosages of cardiovascular medications (antihypertensives, beta blockers, diuretics) they had been taking prior to the anticholesterol therapy. In most of these patients, significant regression of the coronary artery atherosclerotic lesions were documented on repeat angiography (figure 3.6).

Anticholesterol Solution Formulation

The anticholesterol therapy solution consists of 18 L-amino acids formulated in ratios and quantities that are optimal for decreas-

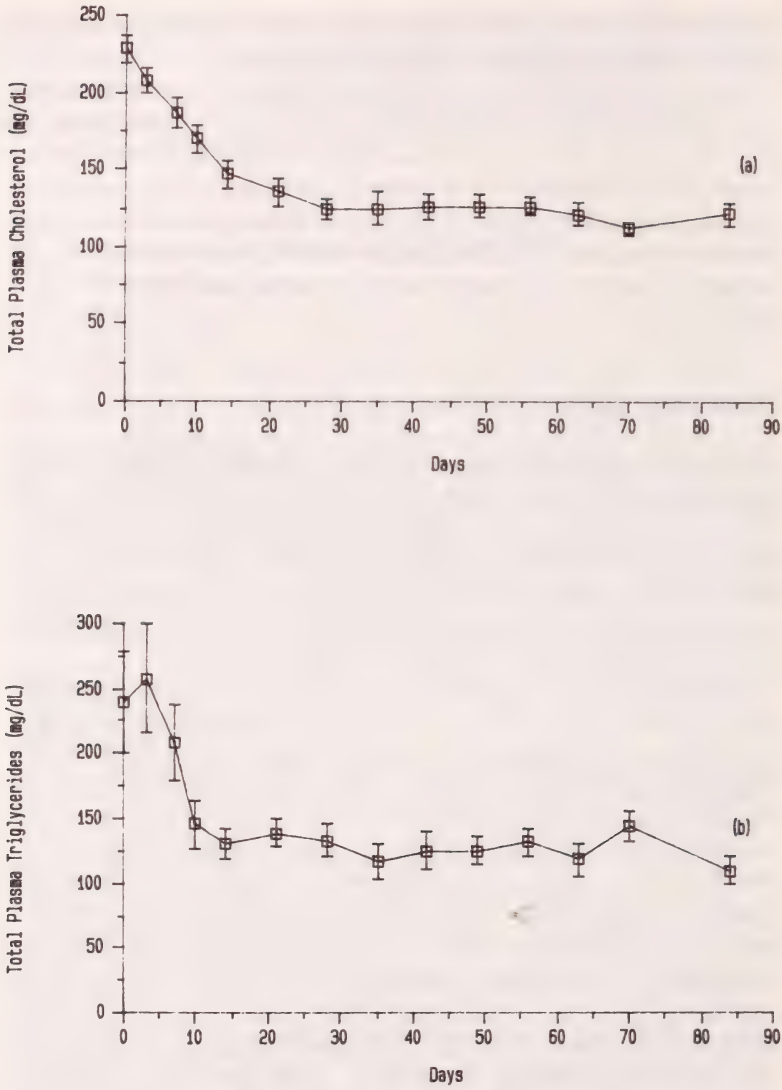

Figure 3.1. EFFECT OF 90-DAY INTRAVENOUS (IV) THERAPY ON PLASMA LIPIDS OF PATIENTS WITH SEVERE CORONARY ARTERY DISEASE (CAD)

Total plasma cholesterol (a) and total plasma triglyceride (b) concentrations in 12 consecutive patients with severe CAD receiving IV anticholesterol were significantly reduced by 44.4 ± 1.25% and 45.6 ± 2.4% from initial baseline concentrations of 229 ± 9.1 mg/dl and 239 ± 38.6 mg/dl (mean ± SEM) by days 10 and 14, and remained at the decreased concentrations for the duration of the therapy.

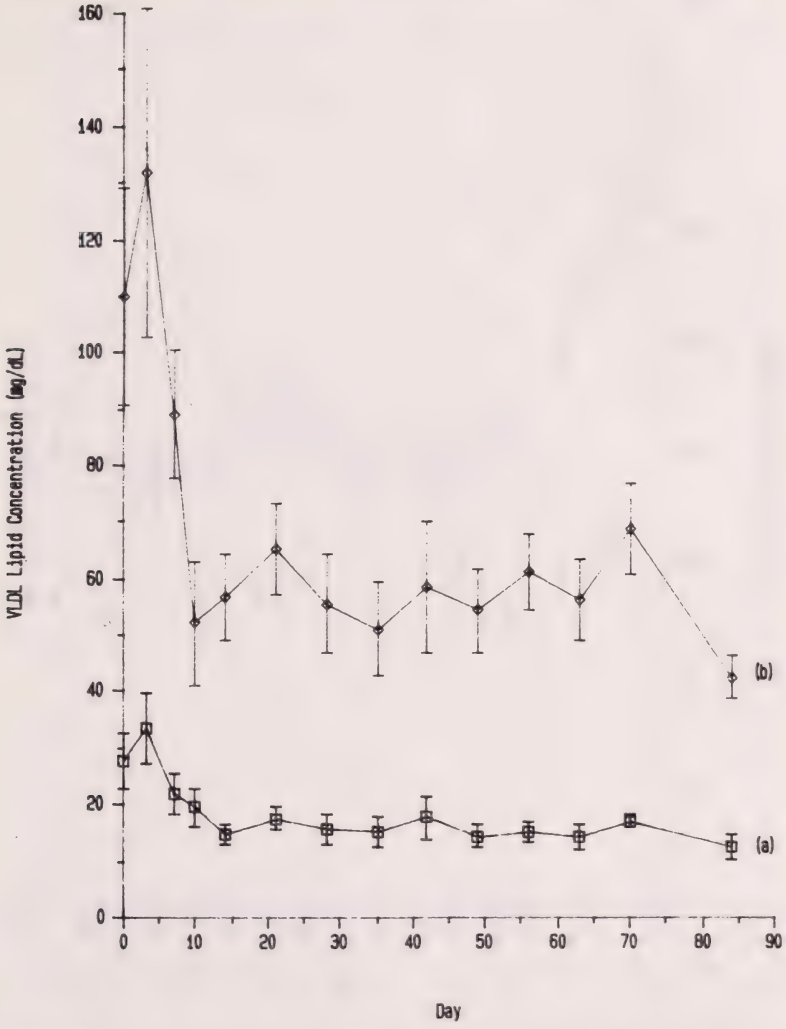

Figure 3.2. EFFECT OF THERAPY ON VERY LOW DENSITY LIPOPROTEIN (VLDL) CHOLESTEROL AND TRIGLYCERIDE LEVELS

VLDL cholesterol (a) and triglyceride (b) concentrations were significantly reduced from the initial baseline concentrations of 28.0 ± 4.87 mg/dl and 110 ± 19.4 mg/dl (mean $\pm$ SEM) by $44.6 \pm 1.93\%$ and $48.1 \pm 2.07\%$ respectively by day ten of the 90-day anticholesterol therapy.

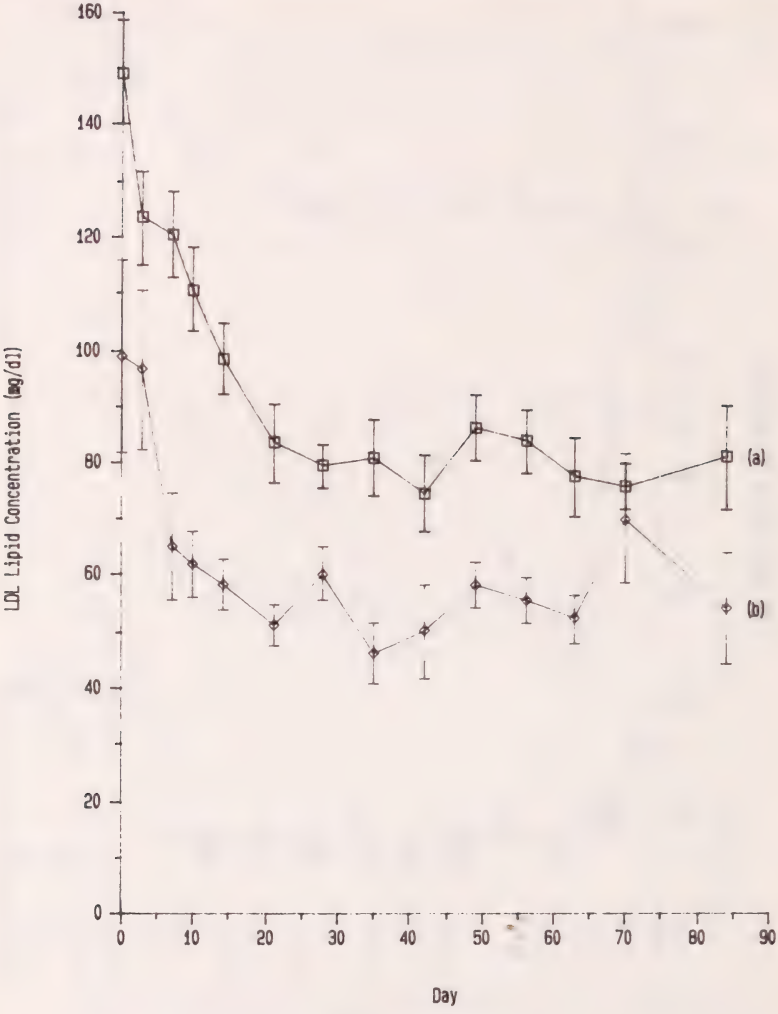

Figure 3.3. EFFECT OF THERAPY ON LOW DENSITY LIPOPROTEIN (LDL) CHOLESTEROL AND TRIGLYCERIDE LEVELS

LDL cholesterol (a) and LDL triglyceride (b) concentrations in 12 patients were significantly reduced from the initial baseline concentrations of 149 ± 9.2 mg/dl and 99.0 ± 17.2 mg/dl (mean ± SEM) by 45.6 ± 1.43% and 45.4 ± 2.62% respectively. Optimal reductions of the LDL cholesterol levels occurred by day 14 and of the LDL triglyceride levels by day 21 of the 90-day period of anticholesterol therapy.

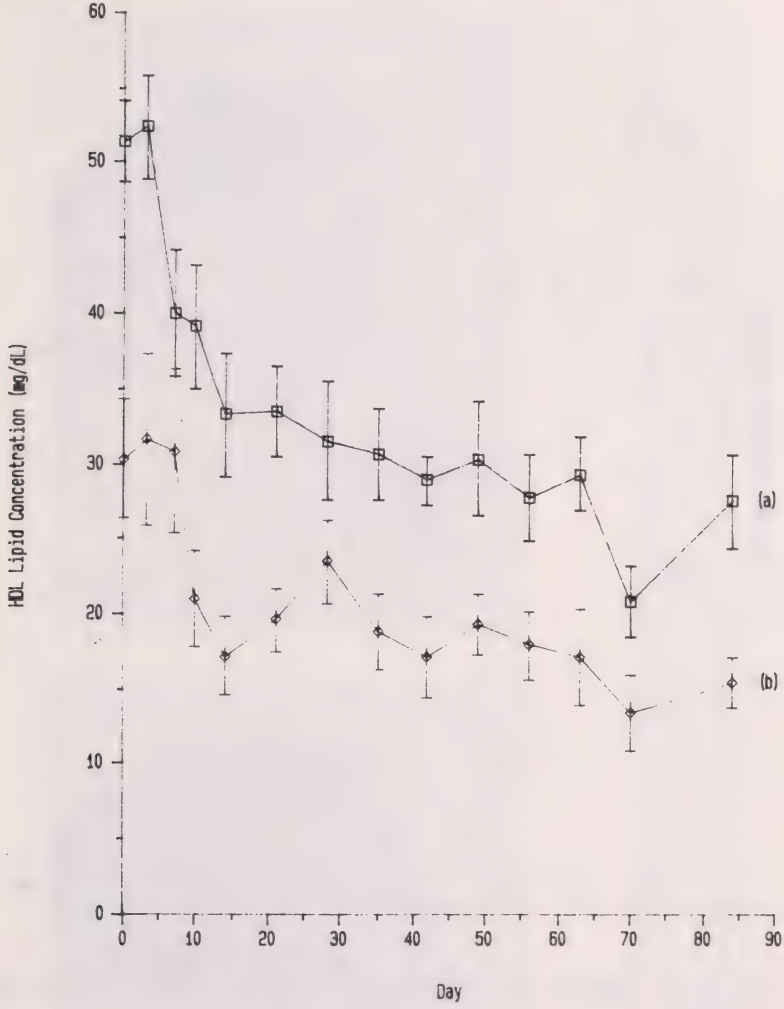

Figure 3.4. EFFECT OF THERAPY ON HIGH DENSITY LIPOPROTEIN (HDL) CHOLESTEROL AND TRIGLYCERIDE LEVELS

HDL cholesterol (a) and HDL triglyceride (b) concentrations in 12 patients were significantly reduced from the initial baseline concentrations of 51.0 ± 2.71 mg/dl and 30 ± 3.88 mg/dl (mean ± SEM) by 43.1 ± 2.31% and 43.3 ± 2.61% respectively. The most significant reductions of the HDL cholesterol and HDL triglyceride concentrations occurred between days 10 and 14. The HDL triglyceride concentrations increased significantly between days 21 and 28, but subsequently was reduced to its previous nadir by day 35 and remained low for the duration of the 90-day period of anticholesterol therapy.

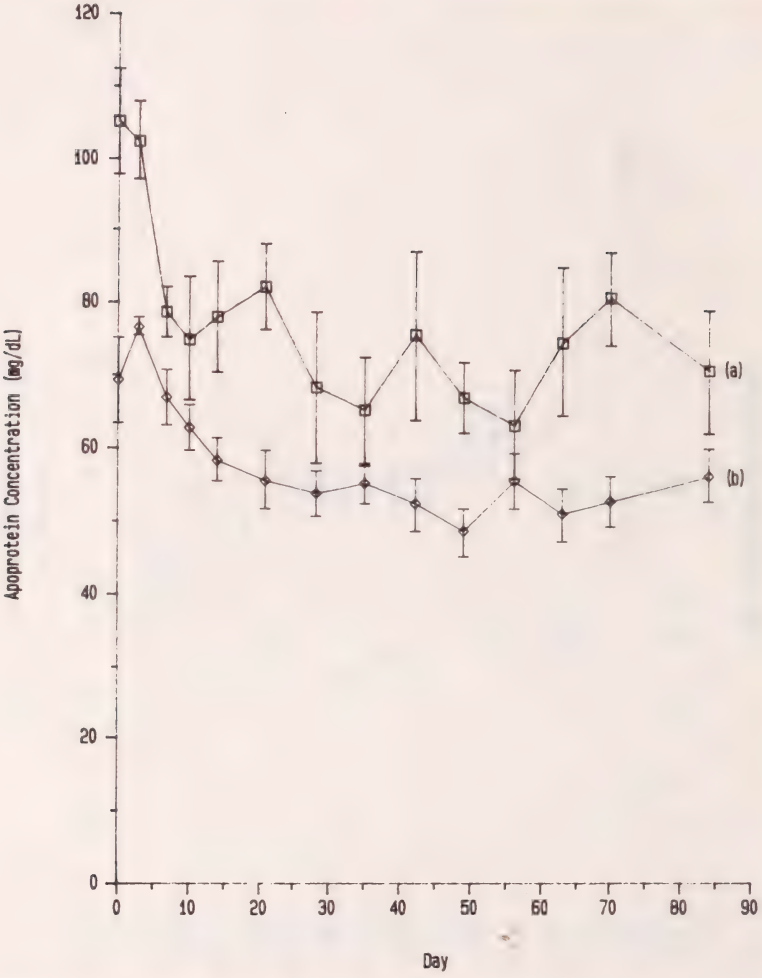

Figure 3.5. EFFECT OF THERAPY ON APOPROTEIN A AND B LEVELS

Apoprotein A (a) and Apoprotein B (b) concentrations obtained in 9 of 12 patients were 105 ± 7.24 mg/dl and 69.0 ± 6.0 mg/dl (mean ± SEM) respectively. The concentration of Apoprotein A1 was not decreased significantly until day 21. The concentration of Apoprotein A1 increased between days 63 and 70, but subsequently was again reduced significantly by day 84. In contrast to Apoprotein A1, the concentration of Apoprotein B100 was reduced significantly from the initial baseline concentration only on day 49 (32.0 ± 5.74%) of the 90-day period of anticholesterol therapy.

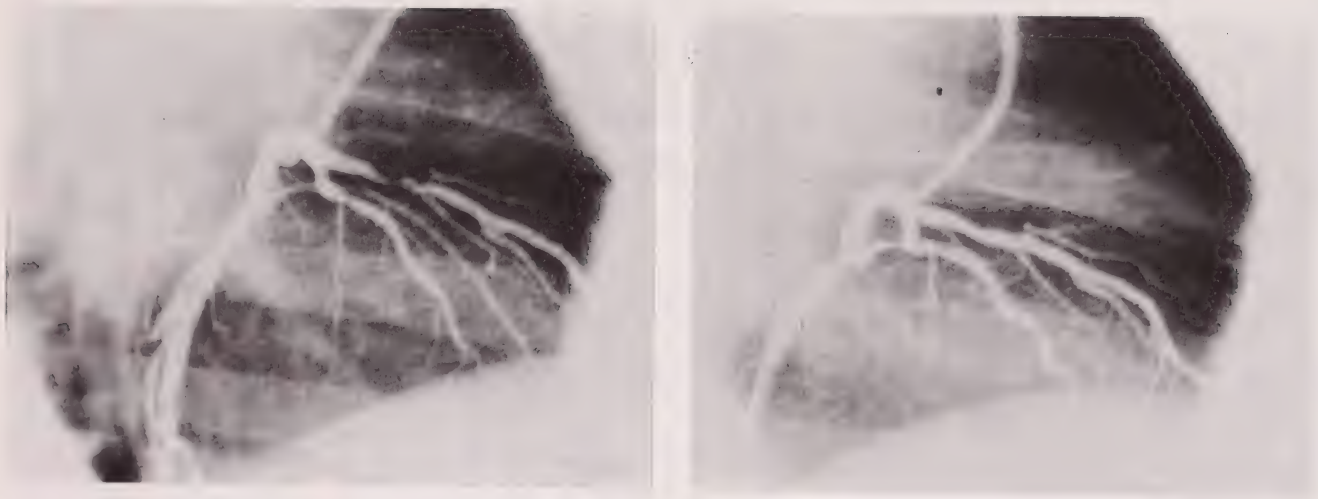

Figure 3.6. REGRESSION OF ATHEROMA FOLLOWING ANTICHOLESTEROL THERAPY

Near-complete occlusion of the left anterior descending coronary artery by atherosclerotic plaque obvious in the coronary angiogram on the left was associated with severe frequent angina on minimal exertion prior to initiation of intravenous anticholesterol therapy. Within a few days of initiating the 90-day period of anticholesterol therapy, the angina disappeared, and approximately 80% regression of the original atherosclerotic plaque was documented by the follow-up coronary angiogram on the right obtained at the completion of the 90-day therapy.

CORRELATION BETWEEN PLASMA AMINO ACID AND PLASMA CHOLESTEROL CONCENTRATIONS

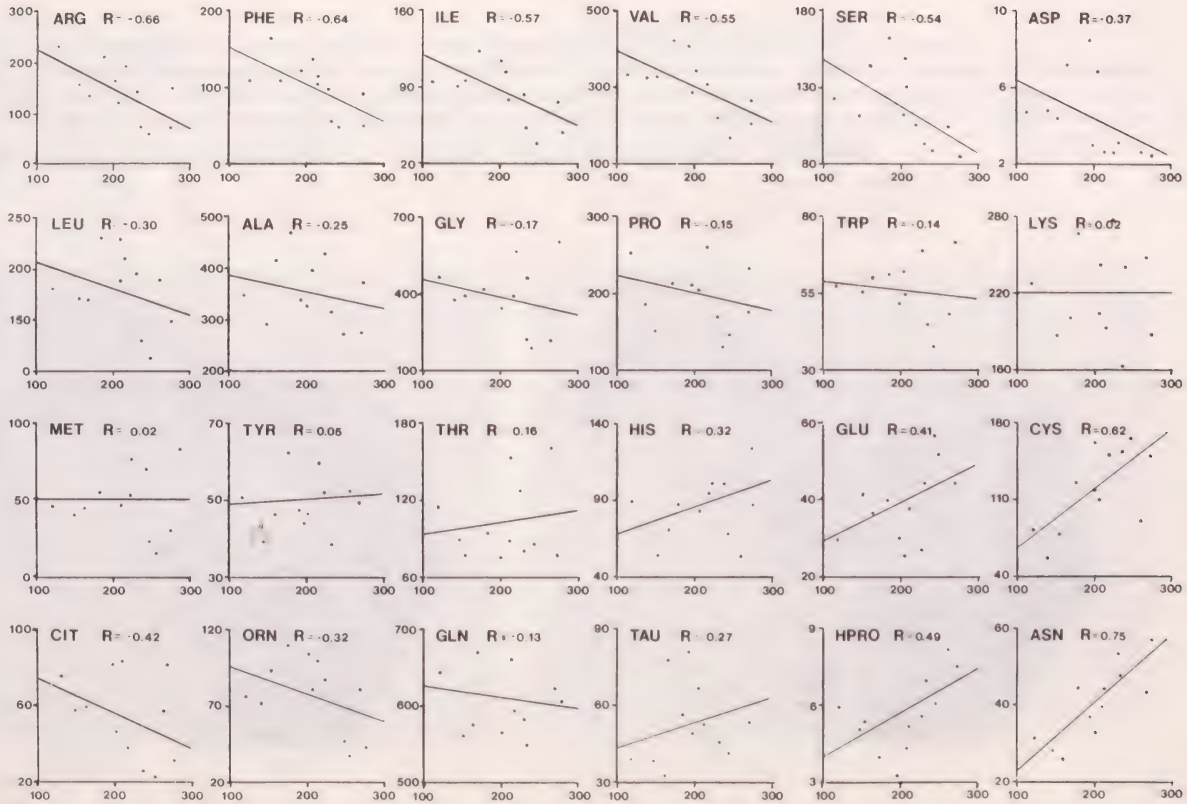
ARG R = -0.66
PHE R = -0.64
ILE R = -0.57
VAL R = -0.55
SER R = -0.54
ASP R = -0.37
LEU R = -0.30
ALA R = -0.25
GLY R = -0.17
PRO R = -0.15
TRP R = -0.14
LYS R = 0.02
MET R = 0.02
TYR R = 0.05
THR R = 0.16
HIS R = 0.32
GLU R = 0.41
CYS R = 0.62
CIT R = -0.42
ORN R = -0.32
GLN R = -0.13
TAU R = 0.27
HPRO R = 0.49
ASN R = 0.75
plasma amino acid concentrations in micromoles per liter
plasma cholesterol concentrations in milligrams per deciliter

Figure 3.7. (opposite page) RELATIONSHIPS BETWEEN PLASMA AMINO ACID AND CHOLESTEROL LEVELS

Correlations between individual plasma amino acids and total cholesterol levels were derived from multiple determinations obtained in 3 patients during 90 days of intravenous anticholesterol therapy. The top three horizontal rows represent the 18 amino acids present in the intravenous anticholesterol solution, and the bottom row represents metabolite amino acids in the plasma. The strongest inverse correlations between the plasma amino acid and cholesterol levels were demonstrated for arginine and phenylalanine, with gradually decreasing order of importance and significance for isoleucine, valine, serine, aspartic acid, and leucine. The inverse correlations are not as significant for alanine, glycine, proline, or tryptophan, and the relationship between plasma cholesterol and plasma lysine and methionine was neutral. Plasma tyrosine and threonine levels showed little correlation with plasma cholesterol levels, whereas histidine, glutamic acid and cysteine had strong direct correlations between their plasma levels and the plasma cholesterol level in increasing order of significance. The metabolite amino acids which are not present in the intravenous mixture but appear in the plasma are related to some degree to the levels of some of the infused amino acids, but the exact nature of their role in cholesterol metabolism remains to be elucidated. (Reproduced with permission from *Annals of Surgery* 1987;206:311).

ing plasma cholesterol concentrations in each patient. Beginning with the base formula that evolved during the patient pilot study, modifications in the amino acid dosages are made depending upon plasma and urine amino acid concentrations determined weekly until stable, and then monthly thereafter. Figure 3.7 demonstrates graphically the positive, neutral, and negative correlations between the individual plasma amino acids and the plasma total cholesterol concentrations derived from multiple determinations in three patients. By analyzing these data and plasma : urine ratios of the individual amino acids, the dosage of each amino acid in the anticholesterol solution can be adjusted to maximize its effectiveness in decreasing plasma cholesterol concentrations.

The average daily anticholesterol therapy solution that can be infused to meet the nutritional needs of the patient while reducing plasma cholesterol concentrations is illustrated in table 3.3. All patients have received the therapy on an ambulatory outpatient basis using a lightweight, portable, computerized pump (from Pancretec, Inc., San Diego, California) to guarantee desired infusion rates with maximum safety. No fat has been administered to the patients since the pilot study, and no evidence of biochemical or clinical fatty acid deficiency has been documented to date. The cholesterol reducing effects of the solution are greatly compromised by the oral intake of even minute

TABLE 3.3. Average Daily Anticholesterol Solution

Amino acids 10.3%	1000 mL	Trace elements *continued*	
Isoleucine	4.0–10.0%	Copper sulfate	1.6 mg
Leucine	5.0–10.0%	Manganese sulfate	0.4 mg
Lysine	4.5–6.5%	Chromium chloride	16 μg
Methionine	3.5–5.5%	Selenium	80 μg
Phenylalanine	4.5–7.5%	Multivitamins	
Threonine	2.0–3.5%	(MVC 9+3)	10 mL
Tryptophan	1.0–2.5%	Vitamin A	3300 I.U.
Valine	4.0–9.0%	Vitamin D	200 I.U.
Alanine	7.0–16.0%	Vitamin E	10 mg
Arginine	9.0–18.0%	Vitamin B_1	3 mg
Histidine	1.5–3.5%	Vitamin B_2	3.6 mg
Proline	4.5–8.5%	Vitamin B_3	40 mg
Serine	2.5–6.5%	Vitamin B_5	15 mg
Tyrosine	0.0–1.0%	Vitamin B_6	4 mg
Glycine	3.0–8.0%	Vitamin B_{12}	5 mg
Glutamic Acid	3.5–5.5%	Vitamin C	100 mg
Aspartic Acid	2.0–4.0%	Biotin	60 μg
Cysteine	0.0–1.0%	Folic Acid	0.4 mg
Dextrose 20–50%	1000 mL	Total water volume	2200 mL
Calcium gluconate	4.7–9.4 mEq	Optional additives as indicated	
Magnesium sulfate	30–36 mEq	Vitamin K (Aqua-Mephyton)	
Potassium chloride	0–60 mEq*	Folic Acid (Folvite)	
Potassium acetate	0–60 mEq*	Iron Dextran (Imferon)	
Potassium phosphate		Cimetidine (Tagamet)	
	20–40 mEq*	Ranitidine (Zantac)	
Sodium chloride	40–80 mEq†	Insulin (Humulin)	
Sodium acetate	0–40 mEq†	Heparin	
Trace elements (MTE – 5)	5 mL	Zinc sulfate	
Zinc sulfate	4.0 mg	Copper sulfate	

*Average total daily potassium dose = 80 mEq.
†Average total daily sodium dose = 80 mEq.

amounts of lipid substrates and are negated completely if the solution is infused by tube into the gastrointestinal tract in rabbits or in humans.

Discussion and Conclusions

It has been known for several decades that herbivores such as rabbits very soon develop arterial lesions resembling those of

human atherosclerosis when fed diets containing milk, meat, and eggs instead of vegetable protein. Originally, the arterial lesions were attributed to the protein in the diet; however, this hypothesis was subsequently largely abandoned when two groups of investigators independently demonstrated that feeding crystalline cholesterol to rabbits also resulted in the development of atherosclerosis (11,12). Their findings generated the theory that the cholesterol in milk, meat, and eggs, rather than the protein derived from these animal products, was the dietary culprit. Nonetheless, several investigators subsequently have demonstrated clearly in experimental animals that dietary protein can also play an important role in the genesis of hypercholesterolemia and atherosclerosis (13,14,15,16). Moreover, epidemiologic studies have provided evidence for a positive correlation between mortality from coronary heart disease and the intake of animal protein which is even better than the correlation between coronary heart disease, mortality and the level of intake of saturated or total fat (17,18,19). However, it must be recognized that dietary variables positively related to mortality from coronary heart disease can be highly interrelated, and it is, therefore, very difficult to determine which statistically significant correlations are etiologically significant and which are not (19).

Intervention studies in humans have also shown that oral dietary protein might play an important role in the regulation of plasma cholesterol levels. When animal protein in the diet was replaced by vegetable (soy) protein, a significant cholesterol-lowering effect was documented. However, such results could be obtained only when the subjects were hypercholesterolemic initially (20,21,22). In normocholesterolemic individuals, replacing animal protein with vegetable protein was found to affect plasma cholesterol levels only to a minor extent or not at all (23,24).

Evidence has accumulated to suggest strongly that substituting plant protein for animal protein such as casein in most experiments lowers plasma cholesterol concentrations (25, 26,27). Although the effects that dietary protein have on cholesterol metabolism have been studied by many groups of investigators, and the available data are currently rapidly expanding, the interrelationships have not been unequivocally clarified. However, epidemiologic studies have documented that vegetarians have lower mean plasma cholesterol concentrations than popu-

lations consuming diets of mixed animal and vegetable proteins (28,29).

The cholesterol reducing solutions that were most effective in the rabbits and in the humans reported in this series of studies resembled plant or vegetable protein in their amino acid composition. Therefore, it appears that the wisdom of ingesting a vegetarian diet, which has been well-described in the basic literature, has been well-documented in these studies under the precise, well-controlled nutritional and metabolic conditions that can best be achieved intravenously.

The advantages of using a totally intravenous diet to induce reduction of plasma cholesterol levels are several: 1) the components of the diet can be finitely defined and precisely administered directly into the bloodstream where they can immediately become involved in the most appropriate biochemical reactions; 2) the cholesterol lowering effect of the optimal mixture of amino acids occurs rapidly to effect 40 percent to 65 percent reductions, which are unprecedented with any other single form of anticholesterol therapy; 3) the patient not only achieves prompt gratification and benefit from the investment biochemically but also symptomatically as hyperlipidemia is reduced with correspondingly decreased blood viscosity and increased microvascular perfusion; and 4) arrest and reversal of atherosclerosis can be documented indirectly and/or directly by techniques that are currently rather imprecise, but are destined to improve in simplicity, safety, sophistication, and resolution.

This technique allows the application of clinical biochemistry directly to the management of a complex nutritional and biochemical disorder with gratifying early metabolic and clinical results. It also allows a degree of control of the countless biochemical processes of the body that are currently impossible to achieve with oral or enteral regimens. Thus the importance of any or all of the individual active components in the solution can be established finitely and specifically via direct intravenous infusion and without potentially detrimental modification by the digestive and absorptive processes of the alimentary tract. Eventually, however, the principles derived from meticulous and conscientious study of the reactions and responses of patients with atherosclerosis to the intravenous nutrient mixtures herein described should allow the development of oral and enteral dietary formulations that will duplicate or mimic the biochemical milieu

of the currently infused substrates after digestion, absorption, and assimilation.

It is crucial that efforts be directed toward achievement of these goals to allow the patient who has benefited from an intravenously induced hypocholesterolemia to maintain the accrued advantages after returning to a judicious oral diet following the intravenous therapy. The ultimate goal is to prove the biochemical importance of maintaining much lower plasma cholesterol levels than have been accepted and tolerated as "normal" in the past not only to arrest and reverse atherosclerosis, but ultimately to prevent this debilitating and often lethal condition. It is anticipated that this relatively pure clinical biochemical approach to the management and control of the number one pathophysiologic process adversely affecting the health and longevity of our population will be rewarded with highly significant reductions in morbidity and mortality and will greatly increase understanding of basic clinical lipid and lipoprotein chemistry.

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Chapter 4

Reflections on Sudden Cardiac Death: Brain and Heart

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Demographers can tell whether a country belongs to the elite of industrialized nations by glancing at that state's leading causes of death. In particular, sudden cardiac death, a problem with ever-increasing world impact, is one decisive indicator that a country has reached the stage of industrial development. An increasing incidence of sudden death reflects the prevalence of ischemic heart disease — the most common class of cardiac disorders, in which occluded coronary arteries promote damage to the heart muscle — in the adult male population. Such widespread heart disease, in turn, reflects the conditions of life in a highly industrialized society.

The magnitude of the problem is not precisely known. It may claim as many as 350,000 to 400,000 victims annually in the United States alone, a victim every 90 seconds. It accounts for 65 percent of all coronary deaths. The classical risk factors do not permit recognition of the potential victim. They help identify those predisposed to ischemic heart disease but not to its sequelae.

Curiously, this pathological entity, now known to be so prevalent, was little appreciated during the first half of the twentieth century, even in highly industrialized countries. Now sudden cardiac death is deemed a common mainstream problem of cardiology. This was not the case even a mere quarter of a century ago. Three factors accounted for its being largely ignored.

First, sudden death was not often observed by the academicians who shape the culture of medicine. As death occurred without prodrome and afflicted the individual while performing mundane chores within the community, the victim did not reach the university or medical school hospital. That which is unseen rarely becomes the focus of attention or even the subject of

thought. Second, no methodology existed for defining the terminal mechanism of sudden death. Third, sudden death had been accepted as the final stage of inexorably advanced coronary artery atherosclerosis, punctuated at the end by myocardial infarction of an extent incompatible with survival.

Medical realities, and the *perception* of medical realities, have in large measure been shaped by methodological breakthroughs. Such breakthroughs have undermined long-held verities and resulted in new hypotheses. Until recent years, the medical community clung to the conceptual flaws relating to sudden death because of prevailing methodological deficiencies. Chief among those deficiencies was the lack of either a method with which to restore an organized heartbeat after the emergence of a fatal arrhythmia, or a reliable battery of drugs for preventing recurrence. It was little wonder that fatalism and insouciance were the orders of the day.

In the early 1960s these theoretical constructs collapsed. The critical breakthroughs related to two advances. The first was the introduction of techniques for cardiopulmonary resuscitation, which increased the time available for restoring a normal heart rhythm. The second was the development of defibrillation and cardioversion for terminating potentially lethal cardiac arrhythmias (1,2,3,4). If the brain could be kept alive by external cardiac massage until the arrival of devices to correct the deranged heart rhythm, and if the arrhythmia once corrected did not recur, how tenable were the hypotheses underlying the bases for sudden cardiac death?

The logical consequence of these early observations was to congregate patients at high risk for sudden death in a part of the hospital equipped both with technology to monitor heart rhythm and with devices capable of instantly correcting a potential malignant arrhythmia. The institutionalization of such arrangements resulted in the modern coronary care unit. A conceptual revolution had been wrought almost overnight (5). It taught that cardiac arrest was likely to occur at the very inception of a heart attack. It proved with finality that the terminal mechanisms were ventricular tachycardia and fibrillation, the two essential rhythm disturbances classically responsible for hobbling the heart's pumping mechanism. It demonstrated the ease of reversing such deranged heart rhythms. It showed the ubiquity of ventricular ectopic activity—abnormal extra beats—

TABLE 4.1. Syndromes of Sudden Death

	Myocardial infarction	Electrical failure
Prodromes	Present	Absent
Multivessel disease	Variable	Present
Ischemic heart disease severity	Variable	Advanced
Myocardial impairment	Variable	Advanced
Duration of final event	Minutes to hours	Seconds
Post resuscitation findings of myocardial infarction:		
ECG	Present	Absent
Enzymes	Sequential	Negative
Monitoring		
VPBs	Present	Advanced grades
Acute coronary occlusion at postmortem	Present	Absent
Recurrence of VF among survivors (1 yr follow-up)	Low ($\leq$5%)	High ($\geq$25%)

during the first days after myocardial infarction. It suggested that protection could be achieved against sudden death by the prophylactic use of a drug such as lidocaine (5). It proved with finality that cardiac arrest was not most commonly due to myocardial infarction, the more commonly considered muscle death seen in "pump failure" of the heart (6).

In effect there emerged a new and distinctive syndrome (table 4.1), namely, sudden death as an accident related to an electrophysiologic derangement which, if promptly reversed, was compatible with prolonged survival. The majority of patients were afflicted with ischemic heart disease. Prodromes were nonexistent or clinically undetectable. Death was instantaneous. Acute myocardial infarction accounted for less than 20 percent of victims (6). Electrical instability of the myocardium was the underlying derangement. Patients experiencing such an unheralded cardiac arrest had a high likelihood of having a repeat event,

purported to be nearly 30 percent in the ensuing two years after the initial successful resuscitation.

Electrical instability of the myocardium was the unique attribute of this syndrome. This term defines an electrophysiologic abnormality wherein the heart is predisposed to develop sustained tachyarrhythmia when stimulated with repetitive pulses. Presumably, new electrical pathways have been established which permit depolarization to propagate along circuits which reenter on themselves, thereby promoting sustenance of repetitive electrical activity. Ischemic lesions, by injuring myocardium, change excitable properties facilitating such electrical oscillations.

Factors Precipitating Malignant Arrhythmias

In studying the problem of sudden death, we have evolved the following hypothetical construct. Ventricular ectopic activity, among patients with ischemic heart disease, is a risk indicator for sudden cardiac death (7,8). Since occurrence of these ectopic beats long precedes the fatal event, it suggests that the electrophysiologic abnormality does not emerge at the time of the catastrophic arrhythmia. Clearly, the pathophysiology long antedates the fatal denouement. What then triggers the final arrhythmia? An intriguing question relates to how the heart catapults itself into a malignant and irreversible disorder in rhythm. One can conceive of anatomic or physiological factors such as altered tone or spasm of a coronary artery, increased blood viscosity, enhanced platelet aggregability, or even transient embolic or thrombotic obstructions that conduce to acute ischemia and myocardial electrical instability. The perturbed heart rhythm may also be the consequence of direct neural action on cardiac excitability.

In the electrically unstable heart, momentary changes in myocardial excitable properties, designated as transient risk factors, can provoke ventricular fibrillation. These risk factors include altered neural traffic to the heart affected by diverse psychological inputs (9,10).

Autonomic Nervous Activity and Ventricular Fibrillation (VF)

Considerable work indicated that stimulation of the peripheral cardiac sympathetic nerves, especially the stellate ganglia, in-

creases susceptibility to ventricular fibrillation (VF) in the normal as well as the ischemic heart (9,10). Contemporary studies provide evidence that psychological stresses of diverse types lower the cardiac threshold for ventricular fibrillation. When these stresses are applied to animals with coronary occlusion, sustained and potentially lethal ventricular arrhythmias are provoked (9,11,12,13,14). Stimulation of critical areas in the midbrain are sufficient to lower the vulnerable period threshold for ventricular fibrillation (12,13).

In the animal with acute myocardial ischemia, such neural stimuli may induce ventricular fibrillation. Parasympathetic autonomic neural pathways are not profibrillatory, since bilateral vagotomy leaves unaltered the arrhythmogenic effect of central nervous system stimulation (15,16,17). With the wealth of data on neural mechanisms predisposing to altered states in cardiac instability, it is surprising that there is a paucity of studies addressing the role of the brain in affecting the heart and predisposing to sudden cardiac death.

Epidemiologic Observations

A wealth of information has implicated psychological factors in the provocation of sudden cardiac death. This belief is deeply entrenched in the cultures of diverse societies. It is uncertain whether such a widely accepted association represents merely folklore or folk wisdom (18).

It has long been known that bereavement increases the prevalence of cardiac fatality. The mortality rate among male relatives of deceased individuals increases significantly during the first year after bereavement. Some studies suggest that the excess mortality is due to arteriosclerotic heart disease (19,20,21). Recession in economic activity, increasing unemployment, also imposes profound social stresses, and is associated with an augmented ischemic heart disease mortality related to the magnitude of the unemployment. The lag between an economic crisis and its apparent human toll is less than five years (22).

Business failure rates are strongly related to mortality in persons age 55 and over (23). In extensive surveys conducted among London civil servants, Rose and Marmot (24) found that not only the level but the type of employment appears to be a factor

determining mortality from coronary heart disease. Blue-collar workers had a three-to-four times greater chance of dying from heart disease than an age-matched population in the higher ranks of civil service. A man's employment status was a stronger predictor of risk of dying than any of the usual risk factors, such as smoking, blood pressure, height-weight ratio, leisure time activities, glucose tolerance, or plasma cholesterol.

The effects of cultural as well as economic dislocation on cardiovascular morbidity and mortality have begun to be viewed as a valid subject for investigation. A high incidence of acute myocardial infarction has been noted, for example, among Indian expatriates in Abu Dhabi. Nearly a quarter of the victims were below the age of thirty. None of the classic risk factors was prominent among these Indian emigrés, but the expatriates were subjected to intense cultural stresses. Such a youthful distribution in myocardial infarction does not occur among Abu Dhabi natives or among Indians in their homeland (25).

The operation of cultural and behavioral factors is also suggested by the time of occurrence of sudden death. In the Manitoba study, Rabkin and coworkers (26) recorded the day of the week for occurrence of sudden death among 3,983 men followed for more than 30 years. Among subjects without previous clinical evidence of ischemic heart disease, an excessive proportion of fatalities was noted on Mondays. By comparison, no significant daily variations were noted for cancer mortality or for the occurrence of myocardial infarction. Recently Muller and coworkers (27,28) noted a significant preponderance in the occurrence of myocardial infarction and sudden death from 6:00 A.M. to noon. They could not implicate operation of circadian factors, but suggested a role for augmented autonomic neural activity associated with early morning activities following waking.

The longitudinal epidemiological studies of the Health Insurance Plan of New York (HIP), involving a large cohort of patients with ischemic heart disease, have indicated an important association between behavioral and psychological factors and the prevalence of sudden cardiac death (29). In earlier investigations among 1,739 men with documented coronary artery disease, the presence of advanced grades of ventricular ectopic activity, during a single hour of sedentary heart rhythm monitoring, was associated with a threefold increased risk for sudden cardiac

death in comparison with men free of such complex ectopic activity (30).

The HIP researchers noted that the level of education was a critical determinant of fatality (31). Patients who had had less than eight years of formal schooling and exhibited complex ventricular premature beats during the single hour of monitoring, experienced a threefold greater occurrence of sudden death compared to better educated men with the same level of ventricular arrhythmia. Possibly the level of education was merely a covariable with other risk factors. Ruberman, who has led these investigations, has identified psychological variables that preempt the role of education as risk indicators for sudden fatality. In a prospective study those who had been identified as living socially isolated and stressful lives experienced all the excess fatality (29).

In these patients, indeed, a lack of education ceased to carry risk for sudden death when these two variables were factored into the analysis. Patients classified as being socially isolated and having a high degree of life stress had more than four times the risk of dying suddenly compared to men with low levels of both stress and isolation.

Ventricular Premature Beats (VPBs)

Ventricular premature beats (VPBs) have been confirmed as risk indicators for sudden cardiac death in patients with advanced multivessel disease, especially among those having severe ischemic cardiomyopathy (32). It is therefore worth examining whether the prevalence or grade of arrhythmia relates to the operation of neural activity or psychological stress factors. We found that activation of the peripheral autonomic nervous system did not affect the prevalence of VPBs (33). By contrast, psychological stresses provoke an increase in the frequency and grade of ventricular ectopic activity. While the precise pathways remain to be defined, sympathetic neural activity appears to play a significant role. Taggart and coworkers (34,35) have shown that a diversity of psychological stresses such as car racing and public speaking, as well as various thermal, physical, or emotional stresses, will induce ectopic activity.

Our studies indicate that psychological stimuli vary in their potential for inducing ventricular arrhythmias. Time-pressured tasks or aversive stimuli which are associated with low-level discomfort do not predictably enhance the prevalence of arrhythmia. More likely to be effective is the anamnesis, or recall from a subject's collective memory bank, of painful emotional events. This is consistent with the observation that life-threatening experiences may not trigger arrhythmia, whereas seemingly tranquil conversations may unleash a veritable storm of complex ectopic activity. Since what is buried in memory is unknown to an outside observer, it is a formidable methodological problem in the laboratory to structure emotionally charged experiences that will replicate this situation.

There is a singularity in the effectiveness of anamnestic recall of aversive events. Once shared with an outsider, these experiences cease to provoke arrhythmias. The underpinning of a scientific observation is its ready replication by any observer adhering to the same methodology. In this area of endeavor observations are invariably unique, singular, seemingly subjective, and more congruent with the anecdotal. It is little wonder, then, that the psychobiological clinical domain continues to be uncultivated by those committed to the rigors of scientific method.

An easier problem is determining the role of behavioral factors in diminishing existing ventricular arrhythmia. We and others have demonstrated that reduction in sympathetic neural activity to the heart—whether achieved by diverse relaxation states, by sleep, by administering beta-adrenergic blocking drugs, or by enhancing vagal activity—will diminish ectopic activity (36,37,38). The changes in arrhythmia are unrelated to shifts in heart rate.

Since the sleep-wakefulness cycle represents a marked diurnal variation in behavioral and neural activity, we have also examined sleep-wakefulness cycles as they relate to frequency of ventricular ectopic activity (39). We have found in a large group of patients that sleep is associated with a decrease in the frequency as well as the grade of ventricular ectopic activity. The largest reduction in VPBs occurred during sleep stages 2 and 3; REM sleep, however, during which normal dreaming takes place, was indistinguishable from the waking state with respect to the prevalence of ventricular extrasystoles.

It should follow that beta-adrenergic blocking drugs would reduce or abolish ventricular ectopic activity in some patients.

Indeed, this has been shown to be the case when the ectopic activity is provoked by stress or exertion. Beta blocking agents may be especially of use in those patients whose ectopic activity is not the consequence of significantly impaired ventricular function (40). Sympathetic neural traffic can also be reduced by augmenting the activity of the parasympathetic division of the autonomic nervous system (15,16,17,41,42,43). Stimulating the vagus nerve, an important parasympathetic pathway, raises the threshold for ventricular fibrillation. Raising this threshold, hence inhibiting the approach of that point when the heart fibrillates, is especially critical when the muscle has been rendered more vulnerable as the result of heightened sympathetic neural activity (15,16,17).

We have found that vagal stimulation by means of an ultrarapidly-acting digitalis glycoside, acetyl strophanthidin, reduced the frequency of ectopic activity by 60 percent in 40 percent of patients demonstrating this arrhythmia. The drug's effect on ventricular rhythm disturbances seems to be independent of the glycoside's positive inotropic action, to which we still turn at times to try bolstering cardiac output in congestive heart failure. The effect appears, rather, to correlate with induction of bradycardia, that is, abnormally slowed heart rate, and prolongation of atrioventricular conduction. It seems reasonable, therefore, to ascribe the antiarrhythmic effect of acetyl strophanthidin to its vagotonic action (45).

Sudden Death and Higher Nervous Activity

It is generally difficult to dissociate variations in the magnitude of myocardial ischemia from psychological stresses on the level of electrical instability. Rarely, one encounters a patient who, in the absence of demonstrable heart disease, nonetheless exhibits life-threatening arrhythmia. We studied one such patient whose arrhythmia was shown to be based on deep-seated emotional problems (46). Cardiac catheterization, coronary arteriography, as well as echocardiography, radionuclide ventriculography, and exercise stress testing failed to divulge evidence of heart disease. However, he experienced several cardiac arrests requiring resuscitation and ventricular defibrillation. Malignant ventricular arrhythmias were triggered by psychiatric interviews, by stressful

emotions, and during REM sleep stages. The arrhythmia was subdued during non-REM sleep, during noncultic meditation, and after the administration of digitalis glycosides and beta-adrenergic blocking drugs. Now, more than ten years later, he continues to be free of any evidence of cardiac impairment; nor has he experienced any recurrent arrhythmias.

The role of psychological triggers was examined more extensively by Reich and coworkers (47) in 117 consecutive patients who experienced potentially lethal ventricular arrhythmias. In about one-fifth of these patients, a psychological trigger factor could be identified as the precipitating cause of the ventricular arrhythmia. In the majority of the patients, the emotional state preceded the onset of life-threatening arrhythmia by less than one hour. The psychological disturbances interpreted as triggers for arrhythmia included interpersonal conflict, public humiliation, threat of marital separation, bereavement, business failure, loss of job, and nightmares.

Four sets of conditions, we believe, contribute to the occurrence of malignant ventricular arrhythmias in a sizable subset of patients. Foremost is the presence of electrical instability of the myocardium; in a majority this results from severe ischemic heart disease. Second is the presence of a psychological state intense enough to burden daily life. Most frequently this is caused by an affective disorder such as significant depression, or a sense of psychological entrapment without a perceived exit. Third is the psychological triggering event. These three factors are dynamically interrelated, as shown in figure 4.1.

Potassium and Arrhythmia

A fourth factor emerging from contemporary clinical observations and from animal investigations relates to the presence of potassium deficiency, hypokalemia. Over more than 35 years it has been appreciated that potassium deficit sensitizes the myocardium to both atrial and ventricular arrhythmias (48,49). This issue recently gained prominence from the unexpected results of the Multiple Risk Factor Intervention Trial (MRFIT) (50,51). In fact, patients who had abnormal electrocardiograms and received diuretics, even though blood pressures were significantly lowered, had a higher death rate from heart disease compared

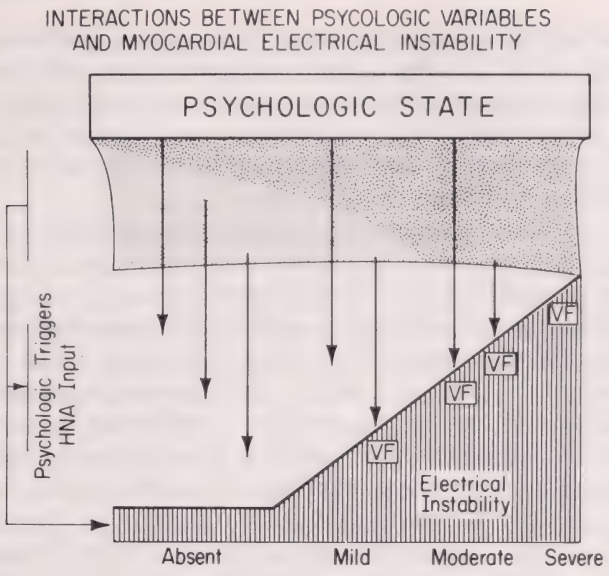

Figure 4.1. Interactions between Psychologic Variables and Myocardial Electrical Instability.

In the absence of electrical instability, psychologic triggers, whatever their magnitude, prove inadequate to provoke ventricular fibrillation (VF) (left side of figure). When, however, electrical instability increases, the intensity of the trigger necessary to provoke VF is less. Ultimately, VF occurs without such triggers when myocardial instability is marked. The third factor is the chronic psychologic state.

to a control population. Among MRFIT patients receiving diuretics, those with lower serum potassium levels were most likely to exhibit VPB's (52).

Indeed, Holland and coworkers (53) have shown that lowering potassium will accentuate the presence of ventricular ectopic activity in one-third of patients during ambulatory monitoring. Nordrehaug and his colleagues (54) have found that patients with hypokalemia have a much higher incidence of ventricular fibrillation complicating their acute myocardial infarction. It is of signal importance that in their study the reduced potassium levels were not related to the use of diuretics, but resulted from the stress of hospitalization.

A relevant study linking hypokalemia even more directly to stress is that of Struthers and coworkers (55). They showed that adrenaline accentuates the potassium lowering action of thiazide diuretic. The potassium reduction resulting from the combined

action of these two agents was profound and reached a mean serum level of 2.7 mEq/l. The hypokalemia was not due to enhancement of potassium loss through the kidneys, but resulted rather from sequestration of potassium in the cellular compartment by stimulation of a skeletal muscle membrane-bound beta-2 adrenoceptor linked Na/K ATPase.

A significant unanswered question is whether the stress-induced lowering of serum potassium affects electrical stability of the myocardium and thereby predisposes to malignant arrhythmias. Hohnloser and coworkers (56) examined the effect of hemodialysis-induced hypokalemia in dogs. Potassium was lowered from 3.6 to 2.1 mEq/l. Such acute hypokalemia decreased the threshold for repetitive ventricular response and ventricular fibrillation by 25 percent. The increase in ventricular vulnerability following acute coronary occlusion was markedly augmented by concomitant potassium depletion. Thus hypokalemia enhances the propensity for ventricular fibrillation in the normal as well as in the ischemic heart. These authors also demonstrated that hypokalemia enhances strikingly the susceptibility to VF by epinephrine (56).

Following acute myocardial ischemia, the increase in ventricular vulnerability to fibrillation is exacerbated by hypokalemia. This is caused by enhanced electrophysiologic inhomogeneity due to increased potassium concentration gradients within the myocardium. This is an important sequence to which attention should be given, since patients with severe ischemia are consistently on large doses of diuretic drugs such as furosemide, and potassium supplementation has been consistently inadequate. This is the very type of patient who is predisposed to both increasing arrhythmia due to electrical instability and increased psychological stresses, but is also susceptible to affective depression, hopelessness, and despair. The addition of hypokalemia becomes the proverbial last straw.

Future Directions

The psychological dimension is too complex to be approached head-on. Future directions will require a more circuitous strategy. With the revolutions now ongoing in neuropharmacology, this may be the most productive in creating a suitable method-

ology for exposing psychobiological relations in human beings. For some time we have focused on the fact that neurotransmitters such as serotonin can blunt efferent sympathetic activity to the heart and to the peripheral vasculature (57,58,59). We have therefore examined whether increased serotonergic activity also affects autonomic neural traffic that modifies cardiac susceptibility and vulnerability to ventricular fibrillation.

This is an especially attractive approach since Wurtman and Fenstrom (60) have demonstrated that synthesis of brain neurotransmitters such as serotonin is modified by dietary means. Using diverse neurochemical tools, we have found that the administration of tryptophan, phenelzine, and carbidopa together results in a sustained 50 percent increase in the threshold to ventricular fibrillation. Tryptophan is the decisive variable (61). We have found that serotonergic activity is increased when tryptophan is administered by cumulation of both serotonin and its metabolites in cerebral spinal fluid. Similar results have been obtained with other serotonergic compounds such as melatonin and serotonin agonists including 5-methoxytryptophol compounds which increase serotonergic activity and reduce neural traffic to the heart (62).

Recent advances in neurochemistry and neurophysiology, as well as the advances of computers, make decisive leaps possible in an area which has been limited by the complexity of the terrain. Whereas in the past one began with a psychological process and tried to define its impact on the biological state, now for the first time one can map the organism's repertoire of responses, both neural and visceral. The implications for cardiology are profound. The nervous system continues to be the unifying substrate for the wisdom of the body. The brain receives and catalogs a myriad of forces that impinge on the organism from within and without. It constantly modifies bodily function through a multiplicity of cybernetic feedback loops.

Progress has been slow in probing neural interconnections and their diverse triggers, especially those in the brain. Methodological problems attending this investigation are extraordinarily complex. Attempts to address these problems are further complicated by the mechanistic formulations still dominating medical thinking (43). The psychosomatic paradigm continues to be perceived as a causal linkage between the painful or aversive force and a resulting emotional or physical strain. A stim-

ulus, whether innocuous or stressful, does not exist as an absolute, divorced from the qualities imparted by its perception.

The response may be temporally remote from the provocative stimulus, thereby obscuring causal connections. In humans, not only immediate sensation but also the preprojection of sensation within the interpretive areas of the brain become generators of neural and neural-humoral traffic affecting total organismal functioning and biological integrity.

Whether or not an event is stressful depends on a complex amalgam of factors, including genetic predisposition and experience in early childhood, a lifelong process of conditioning, as well as an array of social and cultural determinants. An aversive stimulus is rarely singular, overt, and substantial; frequently it is either chronic or intermittent and seemingly insignificant. These and many other factors contribute to the psychological prism that refracts daily events, uniquely and individually. We face a critical challenge in the years immediately ahead—to find appropriate, replicable, and less mechanistic clinical methods with which to address this issue.

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PART III

Cancer

Chapter 5

Oncogenes and Tumor Suppressor Genes

ROBERT A. WEINBERG

Great advances in molecular biology over the past decade have had profound effects on our understanding of cancer and its origins. Ten years ago, it was apparent that agents causing genetic damage were centrally important in triggering tumor formation, but the nature of the damage and its effects on cell behavior were obscure. Much has been discovered since then about the molecular mechanisms leading to cancer. We now have many insights into the specific genes within cells that force normal cells to assume the traits of malignancy. These genes often acquire the ability to induce malignant traits after suffering damage at the hands of carcinogenic agents.

The genes in question have been dubbed *oncogenes*. They have been elucidated in the DNA of tumor cells through a number of experimental routes. Perhaps the most direct of these has been the procedure of gene transfer, which enables an experimenter to extract genes from donor cells and introduce these genes in active form into recipient cells (1). This technique was used ten years ago to assess whether tumor cell DNA indeed carries genetic sequences responsible for specifying cancerous growth properties. DNA was prepared from tumor cells and introduced via gene transfer into nontumorigenic recipients; some of these recipient cells subsequently underwent a conversion to tumorigenicity — that is, to a state in which they, too, could induce cancerous growth. The interpretation of this result was clear and unequivocal: the tumor cell DNA carried "transforming sequences" that could be passed from cell to cell and convey the information for malignant conversion (2).

These transforming sequences remained ill-defined until the advent of recombinant DNA procedures that could be used for

their isolation. The successful cloning of oncogenes resulting from the application of these procedures revealed the presence of discrete, well-defined DNA segments in the tumor cell genome which had all the attributes of genes studied in connection with other biological problems (3). These transforming genes became known as oncogenes, and were soon subjected to the same types of analyses used in studying many other genes.

Origins of the Oncogene

The most immediate question provoked by the discovery and isolation of oncogenes concerned their origin. Were they exogenous genes introduced into target cells during the course of carcinogenesis? Or were they of indigenous origin, being altered forms of normal cell genes? The latter answer soon obtained in a number of cases. This result strengthened the model that carcinogenic chemicals act by damaging existing normal cell genes, converting them into virulent oncogenes able to elicit many of the cell phenotypes associated with cancer.

Still unanswered by such experiments was the nature of the genetic damage induced by mutagenic carcinogens in the normal antecedents to the oncogenes. These normal genes, often termed *proto-oncogenes*, were also isolated by molecular cloning and compared in detail with the related oncogenes. In some instances, the differences between the normal and abnormal versions of these genes was extraordinarily small. For example, in the case of a well-studied human bladder carcinoma oncogene that was 6,000 nucleotides long, several research groups found that the sole difference between the two genes was the change in a single nucleotide of DNA (5,6,7). Accordingly, it appeared that a simple point mutation could effect the activation of a proto-oncogene into a virulent oncogene. This showed that very subtle changes in genomic structure can often serve as the triggering causes of carcinogenesis.

A number of other oncogenes were soon found in human tumors. Their route of activation was often quite different and distinct. In one instance, seen in Burkitt's lymphoma, a proto-oncogene was seen to undergo activation following a chromosomal translocation that juxtaposed it with the regulatory sequences of an immunoglobulin gene (7). In another instance,

the simple amplification in the gene copy number of a proto-oncogene appeared to serve to impart oncogenic activity (8). All this meant that a number of distinct types of genetic changes could serve to create oncogenes and in this way contribute to the formation of a tumor cell.

Retroviruses and Protooncogenes

In 1982, it became apparent that some of these human tumor oncogenes had in fact been discovered in earlier work focused on entirely different subject matter: the biology of retroviruses, those RNA viruses capable of transforming cells to a malignant state. Beginning in 1976, study of transforming retroviruses had shown that these viruses carry oncogenes in their genomes which they use to transform infected cells. It became clear that the oncogenes carried by the viral genomes originated from normal cellular genes (9). This indicated that retroviruses can acquire oncogenicity by picking up and activating normally benign cellular proto-oncogenes.

Many of these oncogenes acquired names from the viruses in which they were first discovered; some of these same genes were then rediscovered in human tumors, in the latter cases unassociated with any viral genetic information. Thus, the H-*ras* oncogene originally found in Harvey rat sarcoma virus was seen to be identical to the bladder carcinoma oncogene (10,11). The *myc* oncogene, discovered in association with avian myelocytomatosis virus, participated in the chromosomal translocation of Burkitt's lymphoma (7). The *erb* B oncogene of avian erythroblastosis virus was much later found to undergo amplification in the human A431 epidermoid carcinoma cell line (12).

These relationships unified two previously distinct bodies of experimental work. More important, they made it clear that the mammalian genome contains a single repertoire of proto-oncogenes, numbering several dozen, that can participate causally in carcinogenesis following various genetic changes. The existence of this group of genes raises the question of their role in the economy of the normal cell. Are they planted in our genome in order to preordain cancer, or do they subserve a more benign role? Detailed study of these proto-oncogenes makes it abundantly clear that the latter is the case.

These genes are essential elements in the regulation of normal cell growth and differentiation. Indeed, they represent central control switches in these processes. They have been conserved over long periods of organismic evolution because they play essential, indispensable roles in the development and homeostasis of the organism and its tissues. In this view, the participation of these genes in cancer comes as the consequence of rare, unintended genetic accidents that may occur spontaneously or may be induced by actively mutagenic agents such as the well-characterized carcinogens to which many of us are exposed.

The phenomenology of cancer as seen by the oncologist, the pathologist, or the epidemiologist, is clearly far more complex than the simple picture evoked by these molecular biological studies. The genesis of a tumor is reflective of a long, complex multistep evolution of normal cells into highly malignant variants. Such complexity is difficult to reconcile with simple changes such as the appearance of single point mutations in *ras* oncogenes. An immediate and correct reaction to this apparent paradox is the conclusion that the formation of single, well-defined oncogenes, while perhaps necessary for tumorigenesis, can hardly be sufficient. The process of forming tumors seems to involve a number of distinct steps, each of which may represent alteration of a distinct cell gene.

This ostensibly paradoxical relationship between the activation of single oncogenes and complex multicomponent tumorigenesis has been further resolved by examining the influence of single oncogenes on fully normal embryo cells (13,14). These cells contrast with those initially used in gene transfer studies which were already premalignant even prior to the introduction of test oncogenes. The introduction of single oncogenes like *ras* or *myc* into the normal embryo cells reveals that these cells undergo only an incomplete conversion to tumorigenicity when expressing such an oncogene (14). This illustrates that each of these oncogenes, acting alone, is only able to orchestrate part of the process of malignant conversion. When the two are introduced concomitantly into these cells, then tumorigenicity ensues (14). Oncogenes cooperate to induce the cell to become malignant.

This simple experiment, although a crude approximation of tumorigenesis occurring in vivo, yields a number of interesting and potentially important lessons. It says that oncogenes can act

in distinct and complementary ways on the phenotype of the cell. It suggests that multiple physiological barriers exist to prevent fully normal cells from becoming malignant—single genetic changes creating single oncogenes are insufficient for the creation of cancer. These results suggest that each of the multiple stages through which normal cells pass on their progressive path to malignancy may be demarcated by the acquisition of a distinct genetic change that creates novel alleles, among them oncogenes.

Oncogene Action at the Cellular and Molecular Level

While this model of multiple collaborating oncogenes has gained increased experimental support, the fundamental metabolic mechanisms that underlie these phenomena remain obscure. More directly, we still have only a poor idea as to how oncogenes are able to create a tumor cell. At the level of cell phenotype, we know that oncogenes like *ras* are able to induce cancer cell traits like anchorage independence and growth factor secretion. Conversely, *myc*-like oncogenes are able to immortalize cells, impart growth factor responsiveness and growth at low cell density in culture (15). These groupings of phenotypes are satisfying because, when taken together, they represent most of the traits known to be associated with cancer cells growing in culture. Nonetheless, such information still fails to provide insight into the biochemical bases of oncogene action.

Recent work from several laboratories has begun to provide clues to explain how oncogene proteins affect cell metabolism. Two fundamentally distinct types of metabolic changes appear to be induced by oncogene-encoded proteins. Many of these proteins, like that of the *ras* oncogene, are found in the cytoplasm of the cell and are suspected to be involved in the deregulation of second messenger pathways that create compounds like the metabolites of the phosphatidyl inositol pathway. The contrasting role of oncogenes like *myc*, which specify nuclear proteins, appears to be involved in the transcriptional deregulation of banks of genes. When acting together, these two types of metabolic change seem able to achieve the full deregulation of cell growth that represents cancer.

Inborn "Errors": the Role of Classic Genetic Studies

While such results clearly represent substantial progress in understanding the etiology of cancer at the molecular level, they can provide only a small part of the genetic explanations required to understand the entirety of this process. Thus, cancer is more than a disease of somatic mutational events activating critical genes like oncogenes. Inborn genetic determinants affecting lifetime disease susceptibility also play an important role, and these are not addressed by discussion of oncogenes. Moreover, oncogenes represent hyperactive, deregulated versions of normal growth promoting genes. Other growth regulating genes, normally involved in limiting cell growth, may also be involved in cancer. The inactivation of such growth inhibiting genes might also open the door to cancerous growth.

Within the past decade, the study of certain familial cancers, notably retinoblastoma, a deadly eye tumor, has provided insight into genes that affect congenital tumor susceptibility and at the same time act as negative regulators of normal cell growth. More recently, we have been involved in the isolation of the gene that determines retinoblastoma onset (16). The cloning of this gene provides an avenue through which many similarly acting genes may act. Among the other such genes are those involved in Wilm's tumor in the kidney, colon, and lung carcinoma, and perhaps even acoustic neuroma in the auditory tract.

In 1971, Alfred Knudson of the Fox Chase Cancer Center in Philadelphia predicted that the onset of retinoblastoma involves at least two genetic alterations in the genome of tumor forming cells (17). This disease appears in two distinct clinical manifestations. The familial form of the disease occurs in children who have inherited a tendency to tumor formation from an affected parent or from a mutated gamete. The sporadic form of the disease occurs in children who have no apparent inborn affliction. Knudson hypothesized that the familial disease is seen in children who have acquired a mutated allele at the moment of their conception; a second mutation occurring subsequently in a retinal precursor cell provides the required second mutated allele. By way of contrast, in sporadic retinoblastoma, both mutations occur locally in a retinal precursor cell that was previously genetically intact.

The isolation of the retinoblastoma gene, the Rb gene, makes possible a direct test of Knudson's hypothesis. Even before this isolation, the work of many others had made it clear that the two genes that serve as targets for these germ line or somatic mutations are the two copies of the Rb gene located on the two homologous copies of human chromosome 13. Moreover, karyotypic observation had made it clear that the relevant mutations involved inactivation of the gene copies, often by deletion.

The molecular analysis afforded by the cloned version of the Rb gene confirms these less direct analyses (16). Thus, many retinoblastoma tumors carry deletions of the Rb gene often present in homozygous form. Use of the cloned Rb probe has also made it possible to trace the transmission of genes conferring tumor susceptibility through complex family pedigrees. In each family, the disease-predisposing element is a defective allele of the Rb gene.

The Rb gene in its normal incarnation must act to prevent progression of a cell to malignancy. As such, it and similar genes have been termed tumor suppressor or anti-oncogenes. These genes influence cancer when they suffer full inactivation; this results in the unleashing of a cell whose proliferation had been previously constrained by the inhibitory influences of these genes.

In the case of the Rb gene, the biochemical explanations of its mechanism of action are still obscure. One clue comes from the recent report that the Rb gene product is a 110 kilodalton nuclear phosphoprotein (18). Such protein may participate in the regulation of gene expression at some level, but further speculation on biochemical mechanisms is not warranted at present.

Manipulating the Gene

Independent of the resolution of these biochemical puzzles, the peculiar role of anti-oncogenes in cancer offers the prospect of unusual types of genetic manipulations. For example, if retinoblastoma tumor cells are tumorigenic because of the absence of functional copies of the Rb gene, then tumorigenicity may be lost when functional versions of this gene are reintroduced into these cells. Such reintroduction can be achieved by use of gene transfer or even through use of viral vectors able to carry genes of interest into cells. Success in causing the reversion of tumor

cells to normalcy should prove directly that the cancerous state of a cell often depends upon the absence of certain critical, well-defined genes.

Such a result has already been obtained indirectly in the course of studying Wilm's tumor cells, which are known to lack a critical gene residing on human chromosome 11. Restoration of an entire chromosome 11 to these cells causes them to lose their tumorigenic abilities (19). This is only the first of many proofs of the notion that loss of critical anti-oncogenes is a critical event in triggering many types of human cancer.

The existence of anti-oncogenes like the Rb gene raises the larger issue of how any gene or group of genes is able to induce malignancy in a cell, given the normally tight intercellular interactions that operate in the context of a normal tissue. These interactions closely regulate the proliferation of individual cells constituting a tissue and would seem to present a formidable barrier to any cell undertaking an aberrant growth program. Here, once again, there are emerging clues. They stem from the observation that a critical element mediating cell growth is the growth factor milieu of an individual cell. All cells display multiple receptors for a variety of these factors. Each of these receptors is coupled, in turn, with a complex intracellular signalling pathway that allows the cell to respond appropriately to an encounter with an extracellular factor. Such encounter may stimulate growth, inhibit growth, or induce differentiation.

Constraints on Cell Growth: Oncogenes as "Liberators", Anti-oncogenes as "Normalizers"

Cell growth within a tissue is normally constrained by two distinct mechanisms. The first depends upon depriving a cell of the growth factors that are normally required to stimulate its proliferation. These growth factors are apparently rationed in tightly controlled amounts. The second, complementary mechanism depends upon the presence of inhibitory factors that actively prevent proliferation. These may act by directly blocking progression through the cell cycle, or less directly by inducing end-stage differentiation with associated cessation of growth.

Viewed in this light, it becomes more apparent how oncogenes and anti-oncogenes are able to uncouple a cell from the humoral environment within a tissue. It now appears that oncogenes act by obviating the normal requirement for mitogenic stimulation by growth factors. This is achieved through at least three mechanisms (20). Oncogenes can force a cell to produce growth factors endogenously. These growth factors may then stimulate the same cell that released them in an autostimulatory or "autocrine" route. The endogenous production of such mitogens makes factors imported from elsewhere in the tissue gratuitous. Oncogenes achieve this autocrine stimulation either by directly encoding growth factors or by indirectly activating growth factor genes.

Oncogenes can also achieve a liberation from growth factor dependency through alterations in the cell surface receptors that are normally used by the cell to detect exogenous factors. Oncogenes acting in this way are altered receptor genes. Structurally altered receptor genes may flood the cell with growth stimulatory signals, even in the absence of any encountered growth factor. Increases in receptor number may also amplify inappropriately the effects of low ambient levels of growth factors. Once again the oncogenes free a cell from dependency on growth factors.

Most frequent perhaps are oncogenes that specify intracellular signal-transducing proteins that normally pass stimulatory messages from receptors to critical intracellular targets. Altered forms of these receptors may emit mitogenic signals constitutively, even in the absence of prior prompting by receptors. As before, the cell is stimulated to grow even in the absence of growth factors.

The anti-oncogenes like Rb that have attracted our attention more recently also seem to exercise their normalizing effect by coupling a cell with an environmental signal regulating growth. But here the detailed mechanistic explanations are still elusive. Indeed, because the physiological roles of anti-oncogene proteins remains undescribed, we are limited to speculations. These speculations center on the possibility that anti-oncogene proteins normally cause a cell to be responsive to environmental growth inhibitory signals. Accordingly, when the functions of an anti-oncogene are eliminated through genetic inactivation, the regulation of cell growth is untrammeled.

By analogy with oncogene function, the signaling pathways in which anti-oncogene proteins participate would seem to involve receptors and signal-transducing devices in the cytoplasm. In the nucleus, too, responder genes may react to encounters with anti-oncogene proteins by shutting down the gene expression. These pathways break down when critical links are deleted following inactivation of the genetic templates that encode them. By necessity, these descriptions remain vague and imprecise, but even these problems will yield answers rapidly, given the powers of genetic engineering and biochemistry.

In the long term, study of such anti-oncogenes and the previously discussed oncogenes offers the prospect of yielding a full description of the genetic elements involved in the regulation of cell growth. These two sets of genes interact with one another in unknown fashions. Normal growth results when the effects of both groups of genes are approximately balanced. Malignancy appears, by the same token, when these genes suffer special types of mutational damage. In the coming decade, we should arrive at a reasonably clear understanding of the metabolic mechanisms through which these genes induce malignant transformation. With this understanding may come radically new insights into the cancer process and into the structure of compounds that may achieve cures for the deadly disease of cancer.

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Chapter 6

Of Light Bulbs and Wine Glasses: Risk Factors and Mortality Trends

PHILIP COLE

In this chapter I am concerned with the pattern of cancer in the United States and how it has changed and continues to change with time. During the twentieth century, general patterns of living in this country have changed substantially, both for the newborn and for the adult. At the turn of the century, the newborn could look forward to, on average, 48 years of life. By 1950, he or she had gained almost 20 years. Between 1950 and 1970, there was virtually no further progress. The pace picked up again between 1970 and 1985, and we continue to gain years of life. Meanwhile, the 40-year-old has not done so well, gaining only three years in the period during which overall life expectancy went up almost 20 years (1).

We can examine these trends from a somewhat different perspective, the gain in life expectancy per decade. Between 1900 and 1950, the newborn gained life at the rate of almost four years for every ten. But the adult gained no more than one-half year per decade. Between 1950 and 1970, there was little gain. The rise in coronary artery disease and lung cancer account for most of this shortfall. Between 1970 and 1980, the rate of gain was restored to three years per decade; two of those three years are now accrued in adulthood. Between 1980 and the present, we have continued to gain two-and-a-half years per decade, all of it accruing in the adult years.

That life expectancy is increasing is obvious, but two factors emerge as significant. The first is the magnitude of this rate of

gain: two-and-a-half years per decade means that for every hour of life lived, each person ages only 45 minutes compared to how much they would have aged ten years ago. Essentially, each person's life expectancy is increasing 15 minutes every hour. Second, and more relevant to cancer, is the fact that this gain is accruing in adulthood. For the first time in history, we are increasing life expectancy not merely by saving children, by reducing infant mortality, but by increasing the life expectancy of adults. We are thus witnessing the beginning of our conquest not just of the infectious diseases, which kill primarily in childhood and youth, but of chronic diseases, which kill the middle-aged and the elderly.

How We Die

There are two paradigms of life expectancies: light bulbs and wine glasses. Light bulbs are programmed to burn progressively for a determined amount of time, and then all specimens of a particular "generation" go out more or less at the same time. Wine glasses at a busy tavern, on the other hand, die subject to random forces: a new wine glass is just as likely to get shattered tonight as is one that has been in the tavern for many years. Where do people fit along the spectrum between these paradigms? To what can we compare their life expectancy? This depends on several factors and has shifted over time.

Among men and women born around the turn of the century, life expectancy was more like that of the wine glasses, at least through childhood and youth into middle age, at which point it settled more toward the middle of the spectrum. People born around 1970, have a distinctly different age-mortality curve, shifted more toward the center at the beginning of life and moving further toward the light bulb end of the spectrum later in life.

The longest-lived humans, according to current statistics, are Swedish females born in 1983: their *median* projected life expectancy will be 85 years. This indicates that the rate of gain of two-to-three years per decade is likely to continue into the future, as American women and men approach this life expectancy. In short, over the next 30-to-50 years, we can expect to add two-to-three years to the life expectancy of people in this country every decade. As such, a person now 50 or 60, instead of looking

forward to about 20 more years of life, as indicated on actuarial tables, may in fact anticipate 30 more years.

Between 1940 and 1982, white men increased their life expectancy after age 40 by 15 percent, from 30 to 35 years. White women increased their life expectancy by 22 percent. Black women now have a life expectancy longer than that of white males and are gaining years more rapidly, whereas black males continue to lag behind and have a rate of gain essentially the same as that of white males. Evidently, gender is a far more important determinant of life expectancy, at least in adulthood, than race.

From where do these spectacular gains in life expectancy come? For all gender-race sectors, about half come from the reduction of heart disease, which has fallen from 300 deaths per 100,000 people per year in 1950 to 200 per 100,000 at present. Cerebrovascular accidents (strokes) have also decreased substantially; injuries and accidents have fallen somewhat, but not in any consistent way. The death rate from cancer, by contrast, has not decreased at all during this period. Cancer should thus be the chief target of public health activity if we hope to continue to increase the life expectancy of adults.

The Special Case: Cancer

Different kinds of malignancies have varied patterns of mortality over time. Death from lung cancer has increased at a very high 3 percent annual rate, only recently beginning to level off. Cancer of the colon has varied little. Cancer of the prostate is on the increase; this is not due to aging but to other factors as yet undetermined. On the other hand, cancer of the stomach and of the cervix have declined sharply. Most of the other malignancies show fairly steady mortality rates. The overall figures demonstrate that cancer in white men in this country is increasing progressively. When we exclude lung cancer, however, the rate over time for all remaining malignancies appears essentially constant (2). Lung cancer is due not to general pollution but to a private form of air pollution, namely, the individual's smoking of cigarettes.

Men of white, black, and Asian origins show different absolute rates of cancer mortality. Black men have a very high annual cancer mortality rate: 287 per 100,000. Asian men show only half

this rate; the rate for white men falls about in the middle. The patterns among the different racial groups show two striking contrasts: among black men, prostate cancer accounts for 15 percent of cancer deaths, double the rate for white men. Death caused by malignant melanoma accounts for about one percent of cancer deaths for white men, a considerably higher incidence than for black or Asian men.

In women, the incidence of lung cancer is rising rapidly, just as it was among men 40 years ago. By 1985, lung cancer was the primary cause of cancer death among women. Breast cancer has maintained a steady rate; surprisingly, colorectal cancer, thought to be linked to diet, has decreased significantly in women but has not decreased at all among men. Uterine cancer has decreased, because of the decline of cervical cancer. This, in turn, is not due, as is popularly assumed, to use of the Pap smear for early detection, for the decline was established long before the Pap smear could have had any significant effect. Other cancers have maintained more or less steady rates of incidence; the big change for women, then, is the stunning rise in lung cancer.

The overall picture for women demonstrates a general decline which has leveled off, even risen slightly, in recent decades. As with men, excluding lung cancer leaves us with a steady reduction in the incidence of cancer. The slight increase over recent decades is due exclusively to lung cancer. The racial breakdown of statistics shows that black women have the highest rate, women of Asian ancestry the lowest, with white women falling in between, but closer to black women in their cancer rate. Two emergent patterns show that among black women, the rate of cervical cancer (nine per 100,000 annually, or 6 percent of cancers) is three-to-four times higher than among white or Asian women. In a pattern similar to that of white men, white women also have the highest frequency of malignant melanoma. Asian women have not only a low general rate of cancer, but also low rates in every category.

Strategies to Lower Cancer Mortality in the Next Decade

The National Cancer Plan incorporates the hope that we may lower U.S. cancer mortality by 50 percent by the year 2000. This

is a goal toward which we may strive; the National Cancer Institute (NCI) has developed a detailed program for moving toward it, which Edward J. Sondik discusses in this volume. Plans include prevention, the major approach for reducing the incidence of cancer; screening, considered to be a minor pathway for reduction; and treatment. The latter strategy does not involve developing new and better treatments but rather improving availability of and access to the treatments presently in existence (3).

Prevention

If all cancer patients could get the very best treatment, the mortality rate might decline by 20 percent, according to NCI projections. If, further, all women had Pap smears and mammography on a regular basis, then it would be possible to reduce uterine and breast cancer by anywhere from 3 to 10 percent. Preventive strategies might achieve another 20 to 25 percent reduction in cancer, the total being close to the projected 50 percent.

One of the major targets of the prevention strategy is tobacco, the use of which causes 125,000 cancer deaths annually in the United States alone. The major cause of death attributable to cigarette smoking is lung cancer, accounting for more than 100,000 deaths a year. Cigarette smokers have ten-to-twenty times the risk of dying from lung cancer as do nonsmokers (ten times for a pack a day, twenty for two packs a day). Cancer of the larynx and mouth, and other less common cancers, are also precipitated by smoking, either alone or in interaction with other factors such as alcohol abuse, and they cause an additional 25,000 or so deaths per year attributable to tobacco use.

The second targeted factor is diet; 8 to 10 percent of all cancer deaths, or 30,000 to 40,000 cancer deaths per year, are thought to be attributable to dietary aberrations, especially excess fat and fiber deficiency, and perhaps also caloric excess. These figures are more controversial than those for tobacco; nonetheless, the public health profession has widely recommended that people reduce fat, particularly saturated fat, intake and increase fiber intake in hopes of preventing cancer as well as cardiovascular diseases.

The third targeted factor of the cancer prevention strategy is occupation. Occupational exposures and chemical exposures in

the general environment that cause cancer receive much publicity; yet in the National Cancer Institute's view, as well as that of most epidemiologists, such factors are actually responsible for a very small proportion of deaths due to malignancy. Among workers in particular industries, such cancers may be a major health problem; but in the broadest perspective, from the viewpoint of American public health, occupational exposures account for no more than 3 percent of the cancer problem in this country, or 14,000 deaths.

Virtually half of all malignancies in this country today are of known etiology, and the etiologic factors are environmental and thus susceptible to favorable manipulation. Tobacco, diet, and occupation, as well as ionizing radiation exposure (largely from diagnostic X rays), some nonionizing radiation (such as that resulting from sunbathing without adequate skin protection), alcohol abuse, and other factors including general environmental pollution together account for the 200,000 annual cancer deaths in the United States that are, in theory at least, preventable.

Treatment

As part of the issue of mortality, it is necessary also to deal with the issue of treatment. Bruce A. Chabner and Marcia J. Browne discuss this topic more thoroughly in this volume, but I shall provide one perspective on treatment, from an epidemiologic point of view. Considering all sites of cancer, from 1960 to 1980 (the last year for which five-year survival rates are available), we find that in 1960, 39 percent of patients survived their cancer—or, in reverse perspective, 61 percent of cancer patients died. By 1980, we had arrived at about the 50:50 point.

How do we express that amount of progress? Using as our frame of reference the 61 percent of people who died in 1960, rather than the total group, we find that we have progressed to saving 11 of the 61 who would have died in 1960, which is 18 percent of the total. This 18 percent increase in survival over a 20-year period, indicates by extrapolation, that if we can increase survivorship by one percent every year, then by the end of the century, the vast majority of people who have cancer will be surviving it.

Turning to the most common individual sites of cancer, among women with breast cancer, 37 percent died in 1960; this has been

reduced to 25 percent in 1980, yielding a 32 percent gain in survivorship. Lung cancer is quite a different story; comparative statistics reveal only our inability to attenuate the increased prevalence of this disease. For prostate and bladder cancers, the picture has brightened considerably; in 1960, one man out of two died from such malignancies, but in 1980, the rate fell to one man out of four, a reduction of 50 percent.

Another way of looking at the effects of cancer and the progress made in fighting it is to determine the proportion of the population whose activity is limited because of malignant disease or treatment. Over time, the proportion of the surviving cancer patient population with activity limited because of their malignancy has increased. This is an indirect testimony to the increased efficacy of treatment: people with activity limitations are accumulating in the population because they are the same people who, 20 or so years ago, would have died from the disease. Now they are more likely to survive because of advances in treatment, thus carrying their diagnosis and limitations with them.

Based on this information and my own studies, it seems fair to say that therapeutic advances are among one of the major determinants of the changing picture of cancer in the United States. Nonetheless, this must be qualified by the realization that true discoveries, major revelations leading to better understanding of the etiology and possible treatment of cancer, are rare, and that their diffusion into the general practice of medicine and surgery is relatively slow. It takes years for the effects of such advances to become apparent: the cancer patient saved today does not count as a nondeath for several years. If experience is any guide, the medical profession must realize that the effects of treatment are, with rare exception, palliative rather than curative.

Conclusion

The reduction of other causes of death, particularly heart disease, will take the American population from where it is today to where it will be by the year 2000. Today, it appears that one American in three will get cancer. By 2000, this will go up to about 35 percent. Today, around 22 percent of people will die

from cancer; by 2000, this will increase to 25 or 26 percent. These are modest changes at best. The real changes come from the unprecedented ways in which Americans get old and older: among Americans alive in 2000, the chances of getting cancer sometime in their lives will be one in two. One in three of all Americans alive in 2000 will die from cancer. This appears, on the surface, to be a negative trend, but the underlying reason for such a trend will be the decline of other causes of death and the aging of the population. There will be no true absolute increase in the risk of developing or dying from cancer.

In summary, adult life expectancy, not just overall life expectancy, is increasing rapidly. Prevention strategies are improving moderately; detection and therapy seem to be improving slowly. Cancer rates, on an age-adjusted basis, are actually stable or declining slowly. Disability from cancer is increasing moderately. Two hundred years ago, cancer was not a major cause of death. By 1998, it will be the major cause of mortality and, perhaps, of morbidity.

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Chapter 7

Prospects for the Drug Treatment of Cancer

BRUCE A. CHABNER
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During the past three decades, medical oncology, defined here as chemotherapeutic intervention, has emerged as the major approach to the treatment of patients with metastatic cancer. It is also the only systemic form of therapy proven to cure metastatic disease. This new treatment has made possible the cure of a significant percentage of patients with the lymphomas, leukemias, testicular cancer, childhood sarcomas, and, when used in adjuvant therapy, even patients with breast cancer and colorectal cancer. Despite these major advances, the number of patients actually cured by chemotherapy remains less than 10 percent of the total cancer population; and most patients who succumb to cancer do so after failing to respond to chemotherapy. In this chapter we discuss the plans of the National Cancer Institute to find new drugs and to increase the effectiveness of currently available agents.

Major changes are taking place in our understanding of the reasons for patients failing to respond to chemotherapy. The genetic and biochemical basis for drug resistance, first examined in animal tumors, has now moved to the stage of clinical testing. The clearest understanding of drug resistance has been gained concerning the antimetabolite class of drugs, of which the best known and most carefully studied is methotrexate. The cellular response to this drug depends on its active transport into the cell, its conversion to a polyglutamate form, its binding to dihydrofolate reductase, and finally the production of a series of alterations in intracellular folate-metabolism (1). Alterations in any one of these steps has been shown to lead to resistance to

methotrexate (2). An appreciation of this sequence of events has led to the examination of alternative compounds that do not require active transport or that act directly on sensitive, folate-dependent enzymes other than dihydrofolate reductase (DHFR) (3). These new antifolates include trimetrexate, a more lipid soluble, potent DHFR inhibitor, and 5,10-dideazatetrahydrofolate, an inhibitor of glycineamide ribonucleotide transformylase (4).

New Concepts of "Polyresistant" Cells

A great deal of interest has been focused recently on the multidrug-resistant phenotype, or MDR cell (5). It has recently been appreciated that tumors may develop broad-based resistance to natural-product-type drugs after exposure to a single agent of this type. Drugs such as vincristine, vinblastine, adriamycin, the epipodophyllotoxins and others are included in the range of resistance. An understanding of this type of resistance is crucial to the treatment of epithelial carcinomas, since malignant cells in adenocarcinomas of the gastrointestinal and respiratory tract show newly developed multidrug resistance, a phenomenon which may also develop following initial treatment in many other types of malignancy (6).

How do these MDR-type cells avoid being killed by antitumor drugs? One pertinent feature of these cells is that they amplify or increase their production of a membrane protein, the P170 glycoprotein, which promotes the active efflux of drugs from tumor cells (7-10). Thus these cells may prove to contain an inherent protective protein that is able to reject a whole spectrum of antitumor agents which might otherwise operate as effective intracellular poisons. In addition, these cells have increased activity of glutathione transferase, an enzyme that detoxifies free radicals, such as those that mediate the antitumor effect of many antibiotic drugs (11). Other changes include an increase in activity of the protein kinase enzyme system and increased phosphorylation of a variety of membrane proteins.

The presence of any one or combination of these changes, if confirmed as an important cause of clinical drug resistance will have immeasurable impact on our thinking and on the strategies we devise for new cancer drug development. At present, the

utility of predictive assays of tumor material for the P170 or glutathione transferase is being investigated in a number of cancer centers. Protein kinase C and the related phosphoinositol pathway are now targets for cancer drug development. A fuller understanding of the function and biophysical properties of the P170 glycoprotein will undoubtedly lead to the design of analogs of current drugs to reduce their affinity for the drug-carrier protein.

Other New Pharmacologic Concepts: Biological Response Modifiers and Protein Kinase C

Protein kinase C has become an important target for drug screening (12). Potent inhibitors of this enzyme have been identified, including the natural product staurosporin and the isoquiline sulfonamide class of drugs. Staurosporin has potent antitumor activity against numerous cell lines, including MDR-type cells (13). Also being investigated are plant phosphoinositols, which inhibit the "second messenger pathway," of which protein kinase C is a part (14,15).

Classic cancer chemotherapy is being challenged at present by a new class of drugs: the biological response modifiers. Drugs in this class enhance or restore immune function and affect the growth regulatory processes unique to each class of tumors. Examples are tumor growth factors (TGF alpha and beta, and the interleukins), epidermal growth factor, bombesin, and the insulinlike growth factors. Strategies for tumor control are being directed at antibody binding to the growth factor or its receptor or the preparation of analogs that block the growth factor.

Manipulation of the Immune System: Immunotherapy and Monoclonal Antibodies

Not only have immune therapies been demonstrated to have activity in their own right, but a number of drugs have been shown to enhance the immune system (16). Examples include the antitumor effects of endogenous natural killer cell activity by cytoxan, and enhancement of LAK cell activity by adriamy-

cin, cytoxan, or flavone acetic acid (17). These findings indicate that combinations of classical drugs and biologicals might provide the greatest opportunity for tumor control. The colony-stimulating factors, such as G-CSF and GM-CSF, offer significant potential for preventing the side effects of chemotherapy and for allowing the use of higher doses of drugs (18,19).

Anyone reading the lay press is aware of the excitement generated by investigators' newly developed ability to produce specific mononclonal antibodies in the laboratory. The antibody response to foreign molecules is a critical component of the organism's defenses and its capacity to adapt to its environment. Because of the plasticity of the genome in regions governing the production of antibodies, it is possible for the immune system to generate antibodies of great diversity and exquisite specificity. These traits are of great potential importance in cancer treatment, in that specificity and ability to recognize subtle structural differences in surface antigens are highly desirable properties of antitumor therapies. The development of monoclonal antibody technology has made it possible to harness the immune system for the purpose of tumor detection and treatment.

Current strategies for using monoclonal antibodies involve an initial phase of determining antibody specificities; the ability to localize to tumor versus host tissues; and the ability of antibodies to generate a cytotoxic response, either through occupancy of a vital receptor site (such as a growth factor receptor) or to activate complement-mediated or cell-mediated cell killing. Early experience with complement-fixing antimelanoma antibodies (20) indicated that it is possible for murine monoclonals, unarmed with either isotope or toxins, to produce remissions in patients with advanced disease, although only 30 percent of patients showed a partial response. Antibodies to surface antigens of chronic lymphocytic leukemia cells and non-Hodgkin's lymphoma have also produced occasional partial responses. These and other investigations have provided strong evidence for the ability of antibodies to localize preferentially at sites of tumor cells. But they also suggest, unfortunately, that mouse antibodies by themselves are not effective agents for cell killing. The consensus among investigators in this field at present appears to be that it will be necessary to arm antibodies with either potent radioisotopes, such as yttrium or bismuth; with bacterial toxins, such as diphtheria or ricin A chain; or with highly cytotoxic drugs, to

produce effective cell killing. An alternative approach is to construct chimeric antibodies containing the Fc backbone derived from humans and capable of efficiently fixing complement, combined with the Fab portion of the mouse immunoglobulin to confer recognition of tumor antigens. Clinical trials of chimeric antibodies and immunoconjugates incorporating isotopes or toxins are scheduled to begin in 1988 under the sponsorship of the National Cancer Institute.

We have seen significant advances in the theoretical basis of anticancer drug development in recent years. Old-line approaches to the formulation and testing of new agents, often emphasizing serendipity and empirical drug research, are finally being, at least in part, superseded. Intriguing new classes of agents, such as the biological response modifiers, are being vigorously investigated. The nature of drug discovery and treatment is changing and will continue to change as developments in cancer cell biology find application in the clinical situation.

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Chapter 8

Progress in Cancer Prevention and Control

EDWARD J. SONDIK

In this chapter I review the nation's cancer prevention and control program. This vital activity is also discussed briefly by Philip Cole in this volume. I focus in detail on the changes that have occurred in this program over the last 15 to 20 years, as well as the trends in cancer that have prompted these changes. Can we fashion a sensible statistical profile of cancer? What changes have we been able to forge in the cancer prevention and control program with the objectives of driving down the incidence and the mortality from this disease? Can we reduce the toll of cancer, and, if so, what factors are likely to be necessary for us to succeed in bringing about these changes?

Trends in Cancer Statistics

As shown in figures 8.1a and 8.1b, the age-adjusted mortality statistics over the last fifty years for many of the major cancer sites have experienced relatively little change. There are three obvious exceptions. First, lung cancer has shown a precipitous rise, although the trends are changing. Second, stomach cancer has experienced a great decline as a cause of cancer death, as has, third, cervical cancer. The latter two show a steady downward decline since early in this period. These statistics do not give the full picture because the trend in the incidence of each cancer — that is, the rate of new cases — is not shown. Nevertheless, the trends in the ultimate measure, the rate of death, are clearly shown in the figure for the major cancers.

The age-adjusted mortality rate does not give the full picture of the recent changes in cancer mortality. The age-specific mor-

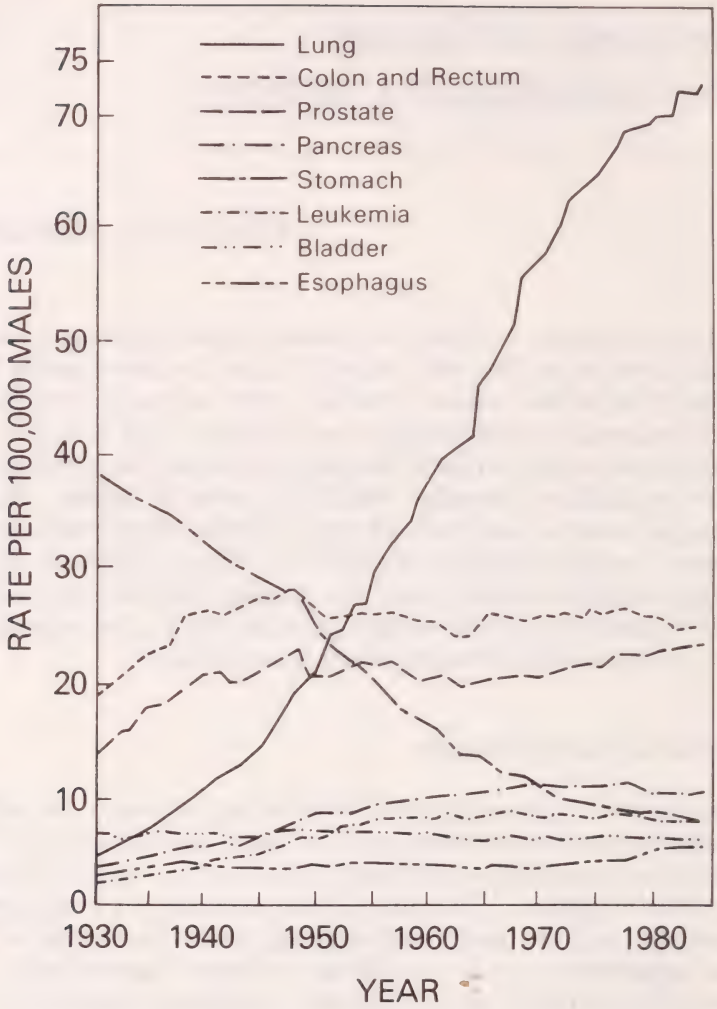

Figure 8.1a. Age-Adjusted Cancer Death Rates for Selected Sites, Males, United States, 1930–1984.

tality rates (table 8.1) show that Americans under age 55 are experiencing a decline in mortality from cancer. In fact, for all cancers combined, excluding lung cancer, the age-specific mortality rate has been declining for all Americans except those age 85 and above. These trends are shown for the 35 years from 1950 to 1985.

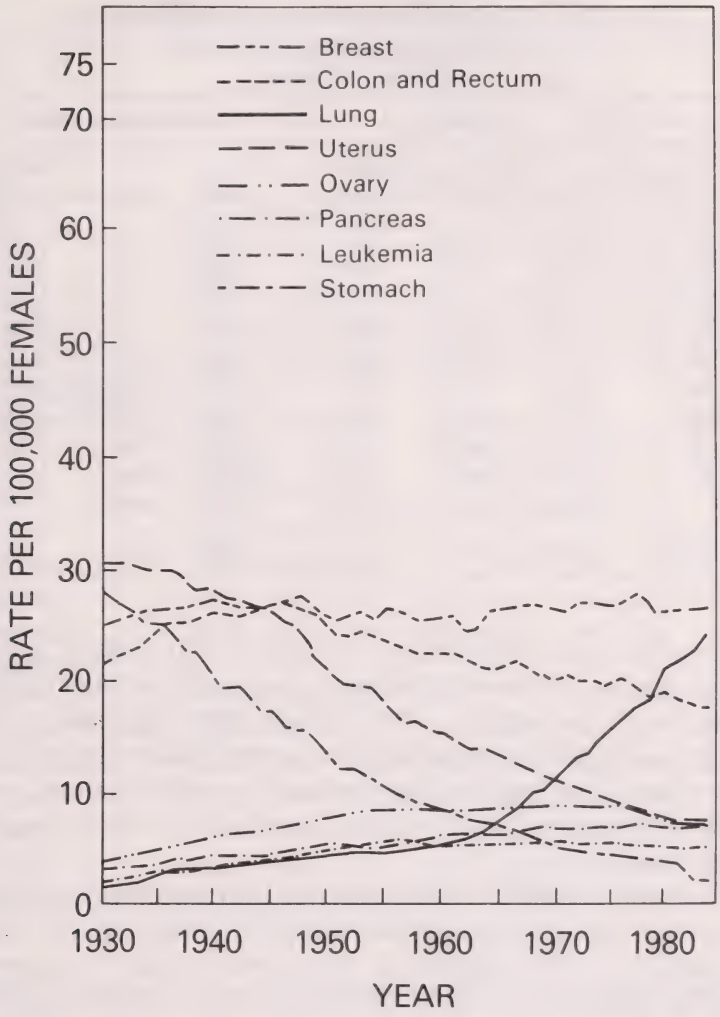

Figure 8.1b. Age-Adjusted Cancer Death Rates for Selected Sites, Females, United States, 1930–1984.

It is particularly instructive to examine the trends in specific cancers over the last 35 years and to review the incidence of these cancers as well as their mortality. All other factors being equal, we would expect that mortality should follow a trend similar to that of incidence. If there is a doubling in the rate of new cancers, and there is no change in treatment effectiveness,

TABLE 8.1. Thirty-five-year Trends in Cancer Mortality
Mortality rates per 100,000 persons
All races, both sexes

	All sites			All sites minus lung		
	1950	1985	Percent Change	1950	1985	Percent Change
0– 4	11.0	3.6	−67.3	10.9	3.6	−67.0
5–14	6.6	3.5	−47.0	6.5	3.5	−46.2
15–24	8.5	5.3	−37.6	8.3	5.3	−36.1
25–34	19.6	12.8	−34.7	18.9	12.2	−35.4
35–44	63.9	48.2	−24.6	59.3	39.8	−32.9
45–54	174.7	169.3	−3.1	154.4	118.9	−23.0
55–64	392.0	441.3	12.6	343.1	292.2	−14.8
65–74	695.0	848.0	22.0	636.1	586.0	−7.9
75–84	1147.5	1290.2	12.4	1092.4	1004.2	−8.1
85+	1444.8	1596.2	10.5	1401.9	1403.5	0.1
All ages	157.0	171.3	9.1	144.0	124.8	−13.3

we would expect the mortality to double as well. Table 8.2 gives the incidence and mortality changes in many of the major cancer sites for the period from 1950 through 1985. The data is for whites and is drawn from the entire United States for the mortality data, and from five geographical areas for the incidence data (Connecticut, Iowa, the San Francisco bay area, Atlanta, and Detroit) (1,2).

The data in table 8.2 show that over the past several decades there has been a major decline in mortality from several forms of cancer. For some cancers — cervix and stomach — the percentage decline in mortality compares with the changes in incidence, while in other cases the decline contrasts with the changes in incidence (colon and rectum, bladder cancers, Hodgkin's disease). In still another case — melanoma — there is an increase in mortality, but the increase is considerably less than the increase in the incidence of melanoma over the time period. Clearly, the trends in cancer are very different for different cancers. In fact, the characteristics of the cancers are such that almost every cancer requires different actions for prevention, early detection, and treatment. Therefore, in order to assess progress and prob-

TABLE 8.2. Site-specific Trends: 1950–1985

	Males and Females							
	All races		Whites					
	Cases	Deaths	Incidence			Mortality		
Site	1985	1985	1950	1985	Percent Change	1950	1985	Percent Change
Stomach	24,700	13,949	26.6	7.3	–72.5	18.4	4.6	–74.8
Cervix	15,000	4,508	32.6	7.3	–77.5	9.9	2.7	–73.0
Melanoma	22,000	5,529	2.9	9.8	242.3	0.9	2.3	147.9
Lung (M)[a]	98,000	83,754	27.4	85.6	212.8	22.0	72.2	228.4
Lung (F)[a]	46,000	38,641	6.8	36.3	432.4	4.9	26.8	447.2
Non-Hodgkin's Lymphoma	26,500	15,358	5.9	13.1	123.1	2.9	5.9	100.3
Testis	5,000	425	2.4	4.5	85.1	0.8	0.3	–60.0
Kidney	19,700	8,660	4.3	7.8	82.1	2.7	3.3	23.1
Larynx	11,500	3,501	3.0	5.1	68.9	1.4	1.2	–12.2
Prostate	86,000	25,940	45.3	76.4	68.7	20.4	21.5	5.7
Bladder	40,000	9,785	12.2	18.4	51.1	5.1	3.4	–32.7
Breast (F)[a]	119,000	40,090	74.4	107.0	43.6	26.4	27.6	4.4
Childhood Cancers	6,000	1,840	10.9	14.3	NA	8.2	3.6	–55.9
Hodgkin's Disease	6,900	1,778	2.8	3.4	23.9	1.7	0.7	–61.0
Colon/Rectum	138,000	57,586	45.8	54.4	18.6	25.7	20.5	–20.3
Uterus	37,000	5,959	23.2	23.7	2.3	8.9	3.6	–60.0
Leukemia	24,600	17,449	9.5	9.6	0.8	6.4	6.6	2.2
Ovary	18,500	11,357	14.6	14.7	0.2	7.9	7.9	–0.4

[a] M and F indicate male (M) and female (F).

lems in cancer it is essential to review each of the cancers separately.

Cancer Control

These trends in cancer rates, the growing population and the concomitant increase in the number of cancer cases, were the basis for the recognition in the 1960s of cancer's growing importance as a public health problem. The trends gave impetus to a movement to forge a stronger and more intensive fight against

the disease. The result was the National Cancer Act of 1971, which gave a new and broader mandate to the cancer fight. It created the National Cancer Program and gave its lead agency, the National Cancer Institute (NCI), a broad mandate ranging from basic research through cancer control. This chapter focuses on changes in cancer prevention and control since the 1971 act.

A number of research activities were begun in the decade following the enactment of the National Cancer Program. One of the most important was a major program in breast cancer screening — the Breast Cancer Diagnosis and Demonstration Program (BCDDP). This program was a large scale demonstration of the newly evaluated technique of breast cancer screening through physical examination and mammography. The purpose of the demonstration was to ascertain whether large numbers of women could be successfully screened and to assess the impact of such widespread screening.

A second major program included a decade-long study of the quality of radiation diagnosis and treatment facilities and procedures. That program, as well as the BCDDP were considered very successful in that both achieved their objectives. However, the ultimate objective of a significant step-up in breast cancer screening has not yet been achieved: encouraging large numbers of women over the age of 50 to be screened on a regular basis using physical examination and mammography. At most, 20 percent of all women over 40 are now screened on a regular basis for breast cancer (1).

Certainly the largest effort, and probably the most significant in terms of its impact on subsequent knowledge development concerning cancer, was the creation of a network of cancer centers, including the stipulation that a portion of these centers would be designated as comprehensive and include a cancer control component as well as basic and clinical research. This program has grown and become a mainstay in the conduct of cancer research. Currently the NCI and its advisers are considering ways of involving the existing network of centers more directly in research on, and in programs of, cancer control.

Other programs enacted throughout this period included programs of research on pain reduction and behavioral issues related to cancer. In addition, a panel was created to assess the opportunities in the area of cancer control. This panel met in 1975, but despite a number of individual program activities, the

TABLE 8.3. Major Causes of Cancer Mortality

Factor or factor class	All cancer deaths, percent	
	Best estimate	Range of acceptable estimates
Tobacco	30	25–40
Alcohol	3	2–4
Diet	35	10–70
Reproductive and sexual behavior	7	1–13
Occupation	4	2–8
Pollution	2	1–5
Industrial products	1	1–2
Medicines and medical procedures	1	0.5–3
Geophysical factors	3	2–4

overall cancer control program did not take a comprehensive approach to control. Yet enhanced comprehensiveness was necessary to deal with a problem as important and as broad in scope as cancer. Part of the problem was a lack of consensus among members of the research and public health communities with respect to the actions that could be taken to reduce the burden of cancer.

Steps toward a better understanding of the potential to control cancer were taken in 1981 in a landmark study by Doll and Peto (3) who developed quantitative estimates of the impact of various factors on cancer mortality. Their results are shown in table 8.3. Results from this study show clearly that tobacco is the primary single cause of cancer. Smoking is responsible for some 30 percent of all cancer deaths. Doll and Peto also identified diet as potentially a major factor in cancer mortality. Their estimates range from 10 percent to 70 percent of cancer deaths attributable to diet, with a mid-range estimate of about 35 percent. The other causal factors pale in significance, although one must realize that specific groups who experience a high level of a particular risk factor will be at much greater risk of mortality resulting from cancer. Overall, the two major causal factors behind cancer mortality are thus clear.

At approximately the same time, the National Academy of Sciences convened a panel of distinguished researchers to review the evidence concerning diet and cancer. They found that there was considerable evidence to implicate diet, particularly

fat, in the incidence of cancer; however, the panel felt that additional research was needed in order to fully understand the relationships between diet and cancer (4).

During the period from about 1980 to 1983, the National Cancer Institute reorganized its Cancer Control Program along the lines shown in figure 8.2. The program includes several major components: a Research Resources Program, a Prevention Research Program, the Cancer Control Science Program, the Community Oncology Program, and a program of surveillance activities (5).

I shall discuss each of these program areas with an emphasis on how these activities have changed, and on the potential impact these programs may have on the control of cancer incidence and mortality and the improvement of survival.

Research Resources

The program in research resources concentrates on the development and maintenance of major resources, including: 1) the network of Cancer Centers across the United States that serve as centers of research excellence and local resources for cancer treatment and control; 2) cancer research training programs that serve to help train the broad array of researchers who will work in the several fields of cancer, including cancer prevention and control; and 3) the Organ Systems Program, which focuses its research effort on several of the major cancer sites including breast, large bowel, pancreas, prostate, urinary bladder, central nervous system, and upper aerodigestive system cancers. All of these research resources serve the entire National Cancer Program, and are not focused exclusively on cancer control support. The next program components, however, are aimed exclusively at the prevention and control of cancer.

Prevention: Smoking, Diet and Other Environmental Perils

The Prevention Program has a number of components including the Smoking and Tobacco Program, aimed at reducing and eventually eliminating the major single cause of cancer; as well as

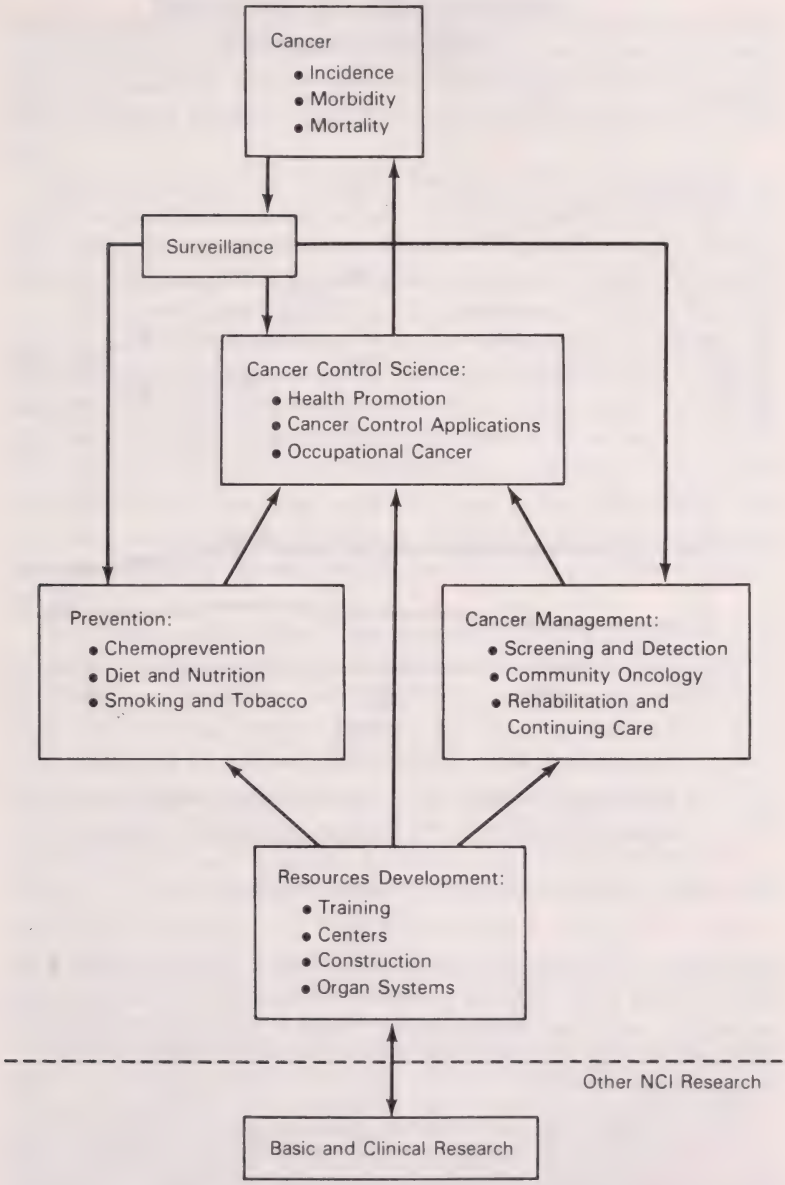

Figure 8.2. Cancer Prevention and Control Program Organization.

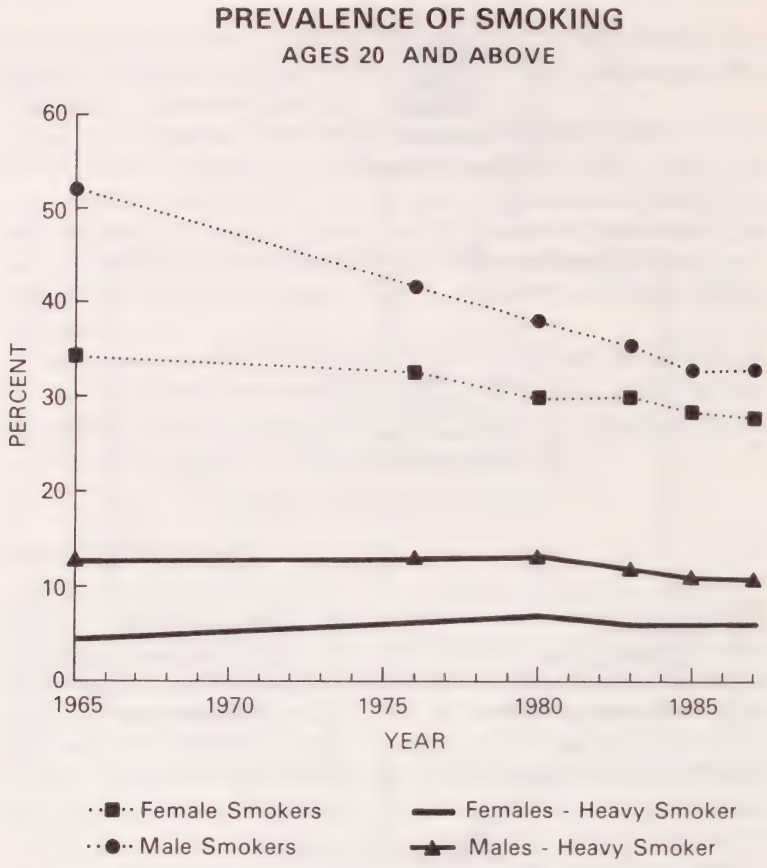

Figure 8.3. Trends in the Prevalence of Smoking.

programs in chemoprevention, the study of particular substances and their role in cancer prevention; and in diet and nutrition, which is closely related to diet chemoprevention but concentrates on the role of diet and various nutrients in cancer prevention.

Since the publication of the surgeon general's report in 1965, we have had a steady downward trend in smoking (figure 8.3). Yet, the figure shows that the percentage of heavy smokers — those who smoke a pack or more per day — has shown little decrease over the past 20 years. The conclusion is inescapable that persons who smoke the most are becoming the prevalent smokers, despite the fact that the number of smokers has been

steadily decreasing. Clearly, the trend is much steeper for males than for females and reflects the fact that more females have begun to smoke in recent years, and the fact that the latter group of new female smokers offsets the number of women who have quit.

The Smoking Program has aimed its effort at a number of target populations. These include children, women, blacks, and Hispanics. The program has also concentrated on the use of health professionals in smoking reduction and, similarly, on the use of the media. In addition, the Smoking Program has designed and is implementing a major clinical trial involving 11 communities across the country, to address the problem of heavy smokers. The program has launched the Community Intervention Trial (COMIT) to use community-based strategies of behavior change to dissuade individuals from smoking. This major commitment of resources, amounting to some $40 million over ten years, is expected to develop and evaluate program strategies that can be widely disseminated to address the problem of heavy smokers.

The Chemoprevention Program has identified some 500 compounds and elements as having potential for cancer prevention. Over the past year, for example, the program studied in vitro some 50 of these compounds in vigorous programs to assess their potential for prevention activity. This program serves as a major funnel to forward potential intervention agents to the Diet and Nutrition Program. In addition, under the auspices of the Chemoprevention Program, a number of clinical trials are underway to determine the efficacy of various agents against specific forms of cancer. For example, studies are underway on the relationship between beta-carotene and lung cancer, on selenium's anticarcinogenic activity, on 13 *cis*-retinoic acid and basal cell skin cancer, and on many other agents.

The Diet and Nutrition Program focuses on the relationship between overall diet, the major dietary intake elements, and cancer. Currently, the program is focused on fat and its relationship to cancer, as well as on fiber. One of the most intriguing possibilities concerns fat and breast cancer. Figure 8.4 shows the relationship between dietary fat intake and breast cancer as indicated from international correlational studies. These studies provide significant motivation for the further study of the relationship and a considerable body of research is now underway.

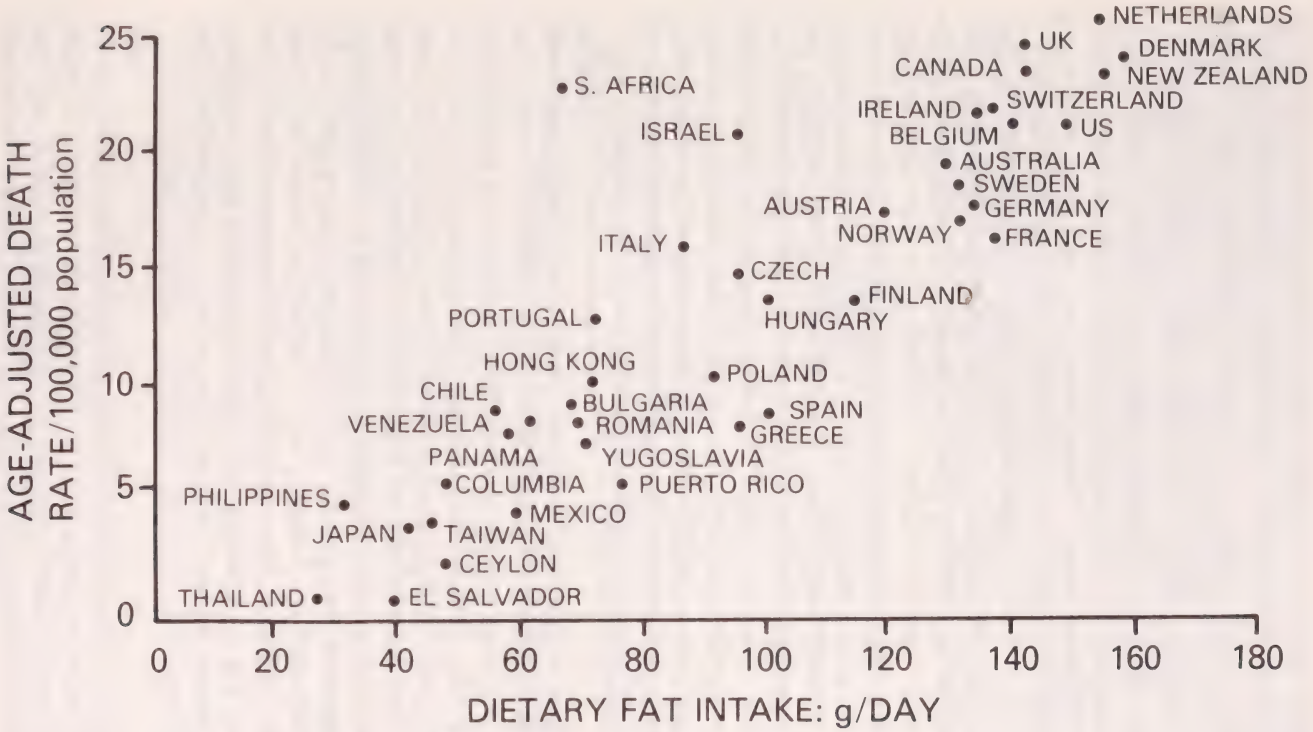

Figure 8.4. The Correlation between Dietary Fat and Breast Cancer.

Another promising avenue of research concerns the relationship of fiber to cancer. In general, the underlying hypothesis is that fiber affects the transit time of fecal bulk and, therefore, affects the potential impact of carcinogens. Thus, because fiber speeds the transit time of fecal bulk, it has the potential to reduce cancer of the colon. The next table shows an analysis of papers that have appeared concerning fiber and colon cancer. The results have been mixed, but there is a significant weight of evidence toward the relationship of increased fiber to reduced incidence of colon cancer.

Again, the results are not definitive, but they are sufficiently suggestive so as to motivate and recommend an increase in dietary fiber to levels approximately equal to those in countries in which the incidence of colon cancer is considerably less than in the United States.

Cancer Control Science

The Cancer Control Science Program is aimed at determining how best to effect change. One of the major efforts of the program is the nationwide Cancer Information Service, which can be reached through 1 – 800 – 4 – CANCER. This service is, in essence, the first line of the National Cancer Program and is called by both the general public as well as health professionals. It is a part of the institute's effort to speed the results of research into practice and to inform the general public of new results and specific issues as they occur.

Another program of particular interest consists of activities with states to develop cancer control plans and programs. This program includes grant- and contract-supported activities directed toward optimum use of information about cancer in their areas. In fact, this information exists in some abundance in terms of mortality statistics, records of tumor registries, various surveys, and other special studies.

The program is also working extensively with special populations who have high risks of cancer, as well as with those who have relatively low risks of cancer. As is well-known, the risk of cancer among blacks is particularly high. As shown in table 8.4, cancer mortality between blacks and whites differs in a number of cancer sites, and, indeed, the most recent changes in

TABLE 8.4. Cancer Experience: Major Differences by Race[a]

	1985 Mortality rate[b]		Percent change 1973–85 Mortality rate[b]	
	Whites	Blacks	Whites	Blacks
Oral cavity	2.9	5.2	−14.8	9.0
Esophagus	2.7	8.3	9.2	5.7
Stomach	4.6	8.6	−26.4	−25.2
Colorectal	20.5	22.9	−6.6	8.2
Liver	2.0	3.4	−7.8	−7.2
Pancreas	8.2	11.2	−2.0	12.2
Larynx	1.2	2.5	−9.1	13.2
Lung	45.9	54.3	30.4	31.3
Breast (F)[c]	27.6	27.7	2.4	9.6
Cervix (F)[c]	2.7	7.0	−37.7	−40.4
Uterus (F)[c]	3.6	5.8	−15.4	−17.0
Prostate (M)[c]	21.6	45.8	2.7	8.5
Total: All cancer	167.8	210.1	4.8	8.3

[a] United States mortality; source, Surveillance, Epidemiology and End Results Program.

[b] Age-adjusted to 1970. The differences in mortality rates between whites and blacks are statistically significant ($p<.05$).

[c] F and M indicate that the rates are female (F) and male (M) specific.

mortality also differ. The magnitude of the change for many of the cancers is greatly disturbing. Note that breast cancer is in the table, not because cancer mortality among blacks is higher for breast cancer, but because the most recent changes show that breast cancer among blacks is increasing at a rate four times that of the increase in whites.

The reasons for these changes are not known and pose a considerable challenge for cancer control. Figure 8.5 shows differences in cancer survival for a number of cancer sites. These differences in survival, plus differences in incidence, (1) give rise to the differences in mortality outlined in table 8.4. The large differences point out just how much room there is for improved cancer control in the black community. To improve cancer control among blacks, the institute has established a network of researchers involved in cancer control studies in the black com-

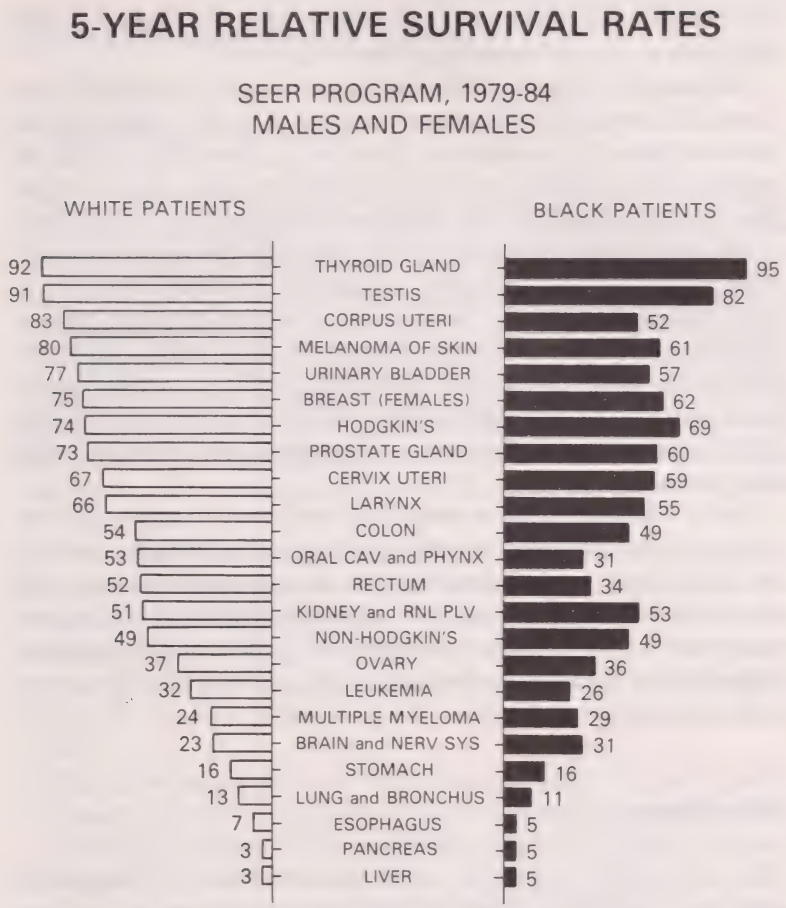

Figure 8.5. Cancer Survival among Blacks and Whites.

munity. The institute is also conducting two studies of the differences between blacks and whites in cancer incidence and cancer survival, both of which should give significant clues to cancer control.

Community Oncology

The Community Oncology Program focuses on transferring state-of-the-art treatment to practice. The program also sponsors and conducts research, and supports work in cancer rehabilitation

and the psychosocial aspects of cancer. It is the focus for early detection in cancer screening research activity.

The major program underway in community oncology is the Clinical Community Oncology Program (CCOP). This program has established a network of groups of physicians across the country who conduct research in their practice communities. The current set of CCOPs is the second increment in this program. In this second phase of the program, the research mandate has broadened from the conduct of treatment research to cancer control research, including prevention, market, and rehabilitation studies, in addition to treatment research. There are now some 53 CCOPs along with their satellite hospital components distributed throughout the country. On the average, each CCOP is expected to place some 200 patients per year on clinical trial protocols.

Since 1980, research on screening and early detection has focused on ways to maximize the impact of our existing knowledge of breast and cervical cancer, and to foster appropriate early detection activity in physicians' offices, particularly during primary care visits. The research underway in detection and screening includes studies of colon and rectal cancers, bladder cancer, and of other cancer sites.

Surveillance

The last major component of the Cancer Control Program is cancer surveillance, which tracks the major trends in cancer incidence, mortality, and survival as well as in cancer control. The purpose of the surveillance activities is to provide the institute with measures of progress against cancer and with information concerning the gaps in cancer control coverage, cancer control successes, and, in general, with feedback on progress against the disease. Surveillance includes a number of components ranging from incidence, mortality, and survival to the tracking of cancer control programs, and the estimation of the cost of cancer. At the core of the program is the Surveillance, Epidemiology and End Results (SEER) Program which gathers data on cancer incidence and survival from approximately 10 percent of the United States population. This program has been

underway since 1973 and provides a consistent database for tracking the major trends in cancer (1).

Cancer Control Objectives

I have outlined how the National Cancer Program reshaped its cancer control program. As part of this reshaping, the program identified actions and activities which can be taken now to reduce the cancer burden in the relatively near future. To guide the program, and to focus attention on those activities that could be taken at the present time, the institute established a set of objectives for the various aspects of cancer control (6). The objectives, which are outlined in table 8.5, were formulated with the aid of expert committees who not only addressed objectives, but addressed potential activities that could be taken to achieve the objectives.

The objectives fall into several areas: prevention of cancer as it relates to smoking; prevention of cancer as it relates to diet; screening and early detection; and cancer treatment. More specifically, the smoking objectives set target levels for smoking prevalence, while the diet objectives relate to the percentage of persons who have diets relatively low in fat or relatively high in fiber.

The screening objectives outline target levels for participation in breast and cervical cancer screening. The treatment objectives outline survival levels that are believed to be potentially achievable based on current knowledge.

The cancer control objectives have been a useful focus for the Cancer Control Program. The state and local Cancer Control Programs have been developed on the basis of these objectives, and the Cancer Centers and Community Clinical Oncology Program has become more active in cancer control research. The Cancer Information Service phone number (1–800–4–CANCER) is an important component of this effort as is the PDQ system, a computer system designed to provide physicians with state-of-the-art information on cancer and on cancer trials.

The reason for establishing objectives and a strong applications program is to identify gaps in optimal care, in prevention, or in detection, so that programs can be mounted to raise cancer care to state-of-the-art levels. Some minority communities, in

TABLE 8.5. Cancer Control Objectives

Control area	Factor	Year 2000 objective	Potential percent reduction in cancer mortality (year 2000)
Prevention	Smoking	Reduce percent of adults who smoke to 16% or less by 1990.	15
		Reduce percent of youths who smoke by age 20 to 15% or less.	
Prevention	Diet	Reduce average consumption of fat from 37–38% to 30% or less of total calories.	8
		Increase average consumption of fiber to 20–30 grams per day from 8–12 grams per day.	
Screening	Breast screening	Increase percent of women age 50–70 who have annual physical breast exam and mammography to 80%.	3
	Cervical cancer screening	Increase percent of women who have Pap smear every 3 years to 90% (ages 20–39) and 80% (ages 40–70).	
Treatment	Transfer of research results to practice	Increase adoption of state-of-the-art treatment.	10–26
		Continue to advance treatment on increase cancer survival.	
Total reduction in Year 2000 Cancer Mortality Rate[a]			35–50

[a]Range accounts for interdependence of objectives, e.g., the effect of breast cancer screening is reduced due to prevention and the range of estimates of advances in cancer treatment.

particular the black community, suffer from considerably lower survival rates than the white community, and, for some cancer sites, considerably increased incidence. The overall survival rate for white cancer patients is approximately 50 percent; the figure for black cancer patients is approximately 38 percent. In addi-

tion, mortality from cervical cancer, for example, is particularly high in the black population — all the more striking when we realize how effective screening is for this disease.

The Role of Basic Science

Basic science remains the foundation for the National Cancer Program. When the National Cancer Act was passed in 1971, few if any individuals anticipated the tremendous growth in knowledge in molecular biology and, thereby, our knowledge of the process of cancer. We have heard the statement often that we are unlocking the secrets of the cancer cell, and it is emphatically true. Indeed, we are even beginning to understand why and how cancer cells metastasize. The bulk of our cancer funds are spent on basic research, but this research must be balanced with application programs to translate the results into practice as expeditiously and effectively as possible. One of the applications of basic research has been to the AIDS problem. Much of our knowledge of AIDS was developed directly as a result of the virus-related research that was undertaken as part of the National Cancer Program.

Conclusions

In the last 15 years there has been considerable progress in cancer. First, we know that we can reduce cancer just with the information we have at hand. Over 30 percent of cancer mortality is related to smoking, and the impact of reduced smoking in white and black males can be seen in a reduction in the incidence of lung cancer.

We know from our data, contrasting population groups and geographic areas, that a portion of the differences in cancer experience between different groups can be reduced either through screening, early detection, or the application of state-of-the-art cancer treatment, or through life-style changes. The NCI estimates that anywhere from 25 to 50 percent of cancer mortality can be reduced by the year 2000 if our full measure of knowledge is applied as effectively as possible (6).

Indeed, technology transfer — the application of the results of research — is a critical factor in reducing the burden of cancer.

The image of cancer among many persons — that it is a disease that cannot be fought — must be combated. There are many examples of cancers for which the prognosis has increased greatly over the past several decades. For example, survival from childhood cancer has increased from nearly always fatal to a five-year relative survival rate of over 60 percent (1). Hodgkin's disease has shown great increases in survival and concomitant decreases in mortality.

Other cancer sites, including the more common cancer sites, also show gains: colon cancer and rectal cancer have shown a 20 percent increase in incidence over the last 35-year period, but a 19 percent decrease in mortality over the same period. Bladder cancer also has shown an increase in incidence, for reasons that may have to do with smoking and certain chemical exposures; however, the mortality from this disease has fallen a considerable amount over this time, again in the face of increasing incidence. In fact, most cancer sites have shown some degree of improvement in prognosis over the last thirty-five years.

My third conclusion has to do with the cancer control objectives. These have proven to be remarkably useful as a guide for national efforts as well as state and local cancer control efforts. These objectives assist decision makers in assessing priorities and allocating their resources in such a way so as to benefit their own region. Moreover, these objectives serve to state publicly what can be achieved, and to hold the leaders of the National Cancer Program accountable for meeting these objectives.

Cancer Prevention and Control has developed into one of the major programs of the National Cancer Institute. It will be important to review the progress of this program on a five-year basis to determine the extent to which, indeed, it is meeting its promise.

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PART IV

Trauma

Chapter 9

Injuries in America: A National Disaster

SUSAN P. BAKER

Trauma has always been an important health problem. Whether considered to be part of our heritage of frontier glory or a national curse, violent injury has been a part of the American scene since the beginning. What is new and different in recent decades is the importance trauma has gained in relation to other health problems. Consider what has happened with infectious diseases during this century: death rates from tuberculosis, diphtheria, and other infectious diseases have dropped dramatically. At the same time, death rates from injury have declined much less.

Trauma is the number one cause of death in this country in individuals between one and forty-four years of age. A single group of injuries, those caused by motor vehicles, constitutes the leading cause of death from age one to thirty-four (1). Since that approaches one-half the life expectancy of the "average" American citizen, each of us can expect to spend nearly half of our lives at greater risk from a traumatic death than from any other cause.

Because of their special significance to children, teenagers, and young adults, injuries rob us of more years of life than any other disease. In fact, potential years of life that are lost from injuries prior to age 70 are equal to those lost from heart disease and cancer combined (2). It is ironic that even though the loss of potential productive years of life is far greater for injury than for any disease, the resources available for research and prevention are far less than for other major killers. Federal research dollars applied to the injury problem amount to less than 20 percent of comparable funding for heart disease and about 11 percent of the research funding for cancer (figure 9.1). This inequality between the size of the problem and the resources

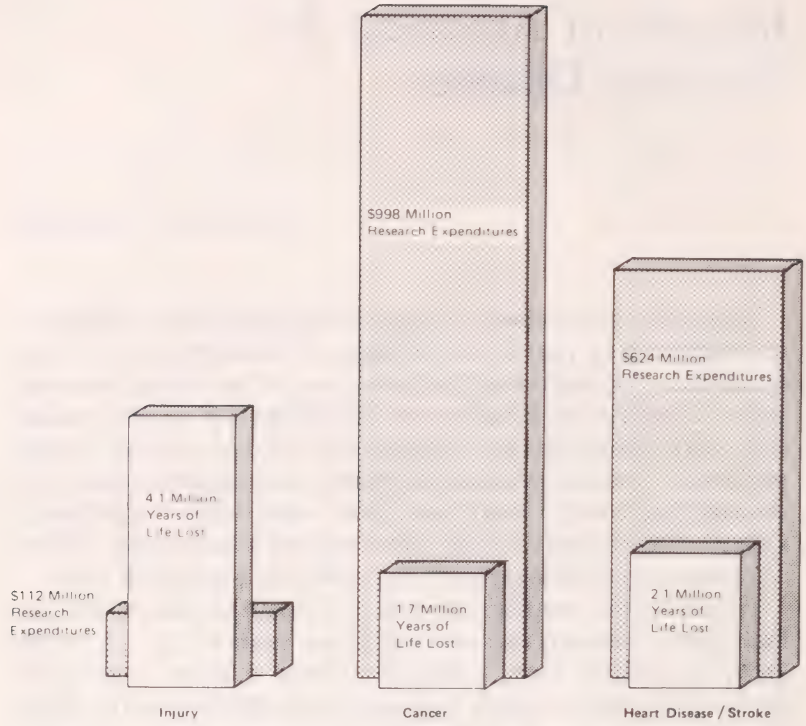

Figure 9.1. Preretirement Years of Life Lost Annually and Federal Research Expenditures for Major Causes of Death in the United States.

that the federal government is spending on research is a serious problem. It should arouse the interest and concern of both the communities concerned, medical and civic.

The Maldistribution of Risk

The burden of injury is distributed unequally among members of our population. There are distinct differences in death rates and injury rates among various racial groups; in each group, people of low economic status are especially disadvantaged. In the case of homicide, black males are at sixteen times greater risk than white females; the lifetime risk for a black male is such that at birth he has one chance in twenty-eight of being murdered. There are, in addition, extreme differences in risks among

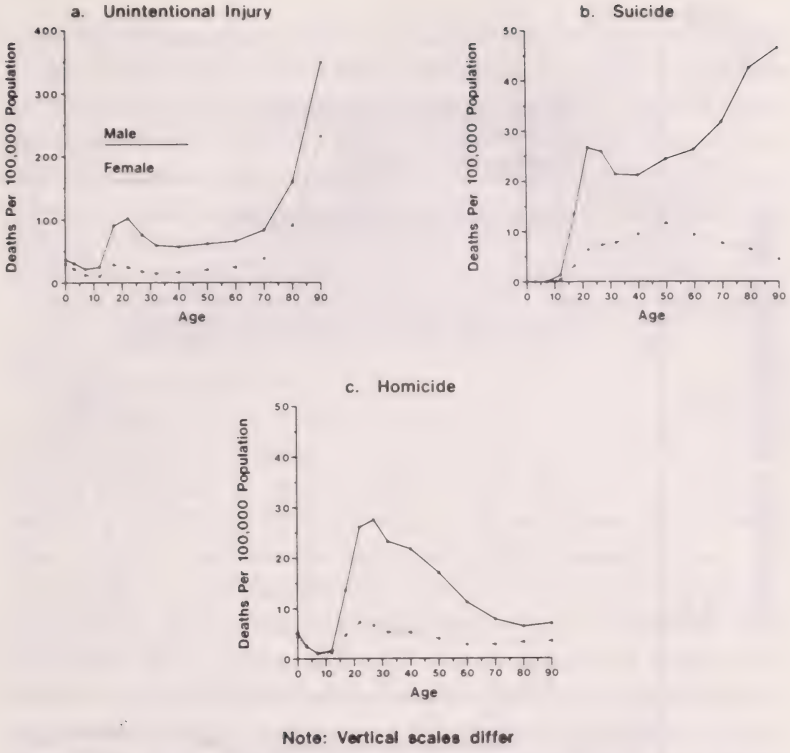

Figure 9.2. Death Rates from Unintentional Injury, Suicide, and Homicide by Age and Sex, 1977–1979.

the various age-groups. For all unintentional injuries combined, the elderly have the highest death rates per 100,000 population (figure 9.2). There is also a pronounced peak in the death rate in the 15-to-24-year age-group, which experiences one-fourth of all injury deaths, and a smaller peak among younger children.

Suicide and homicide rates exhibit striking differences among various age-groups. Death rates from suicide, for example, are relatively low in elderly females but high in elderly males. In younger individuals there is another peak in the rate of suicide, with high mortality in the 15-to-24-year age-group. The younger age-group has also experienced major increases in the suicide rate in the past decade, especially for suicide by firearms. The high rate of suicide among women in the 45-to-54-year age-group is an interesting phenomenon that has not been thor-

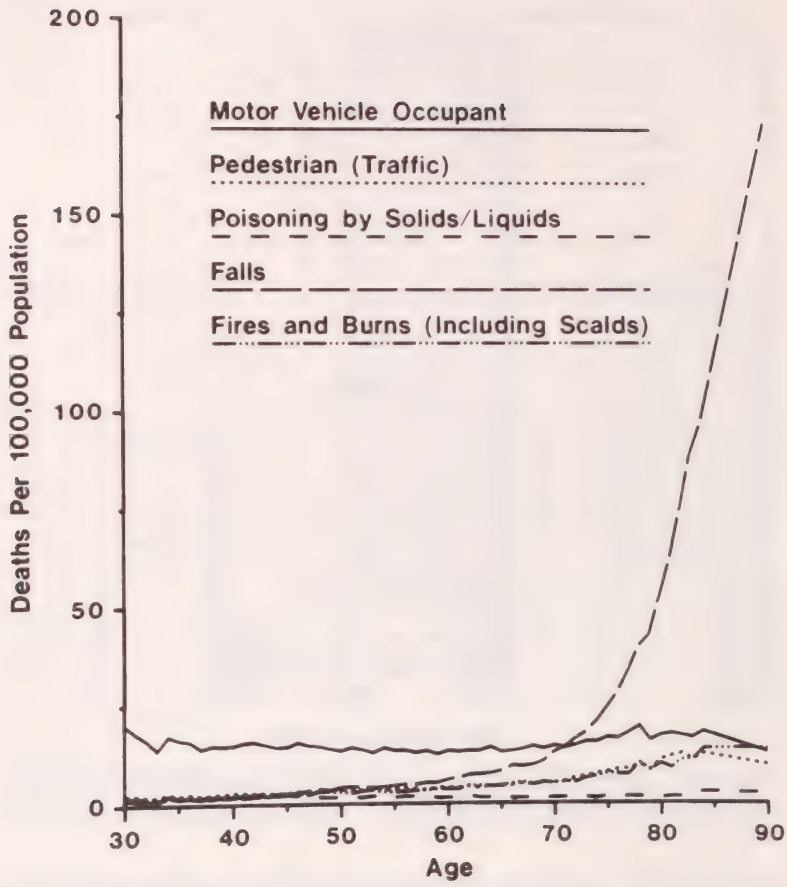

Figure 9.3. Death Rates from Unintentional Injury by Age and Cause, for Ages 30 and Older, 1977–1979.

oughly researched. Homicide rates are especially high among people in their twenties and thirties, particularly among males. Firearms, which account for more than half of all suicides and approximately two-thirds of the homicides, are the leading cause of death in the black population 15-to-34 years of age (3,4).

The death rate from all unintentional injuries combined is highest among the elderly primarily because of the very high rate of death caused by falls (figure 9.3). Not only may the elderly be more likely to fall, but when they do they are much

more apt to sustain a fracture, especially of the hip. Every year in the United States, more than 200,000 people aged 65 or older are hospitalized because of hip fractures, with the rates increasing dramatically with age. Special opportunities for the prevention of falls and other injuries in the elderly are present in long-term care facilities and residential facilities for the elderly. Even though the majority of falls occur elsewhere, the risks to residents in such institutions are high and the payoff for prevention is substantial. Yet, too often, one finds that such facilities have tripping hazards, hard surfaces to fall on, and an absence of easily grasped railings.

Death rates from motor vehicle crashes show a distinctive pattern, with extremely high rates in 18- or 19-year-old drivers for all categories of crashes, both single vehicle and multiple vehicle (figure 9.4). Older drivers in general have much lower rates of fatal crash involvement per 10,000 licensed drivers. In one category, multiple-vehicle crashes occurring at intersections, an increase in involvement rates can be seen in drivers after about age 65 (2). Thus, although elderly drivers as a group do not have the high death rates seen among teenage drivers, there are certain types of crashes to which they are especially susceptible. Apparently, this group of drivers is particularly vulnerable to collisions stemming from their decreased ability to perform the required visual tasks and to exercise judgment appropriately. Such tasks include their ability to see other vehicles and to gauge the speed at which vehicles may be approaching them when they are driving across an intersection, or moving out into a stream of traffic from a side road.

Alcohol-related crashes are known among drivers of all ages, but especially among drivers in the 20-to-39-year age-group, whose fatal crashes are predominantly related to alcohol. This is true for women as well as men, and is especially characteristic of nighttime crashes. When a 25-year-old driver is seriously injured in a 2:00 A.M., single-vehicle crash, the chances are great —perhaps 80 percent—that the driver has an alcohol problem. It would be interesting to know how many hospitals attempt to address the alcohol problem in addition to treating the physical trauma when such a patient is admitted.

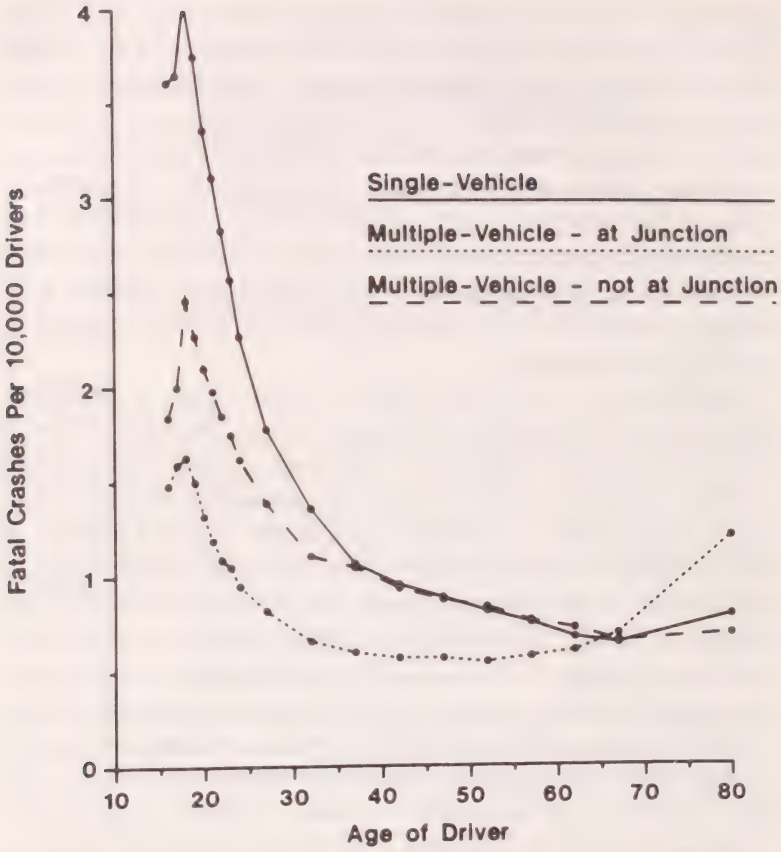

Figure 9.4. Fatal Crash Involvement Rate by Age of Driver and Type of Crash per 10,000 Licensed Drivers, 1979–1981.

Geography Shapes Destiny

Demographic and geographic factors are also associated with high death rates in nonvehicular forms of violence and trauma. As shown in figure 9.5, death rates from house fires, for example, are highest in the Southeast (2). In that region, highly flammable homes, noncentral heating sources, and great distances from fire-fighting equipment all contribute to the hazard of death by conflagration.

Similarly, geography has a major impact on levels of vehicular trauma. Motor vehicle fatalities, as well as deaths from several

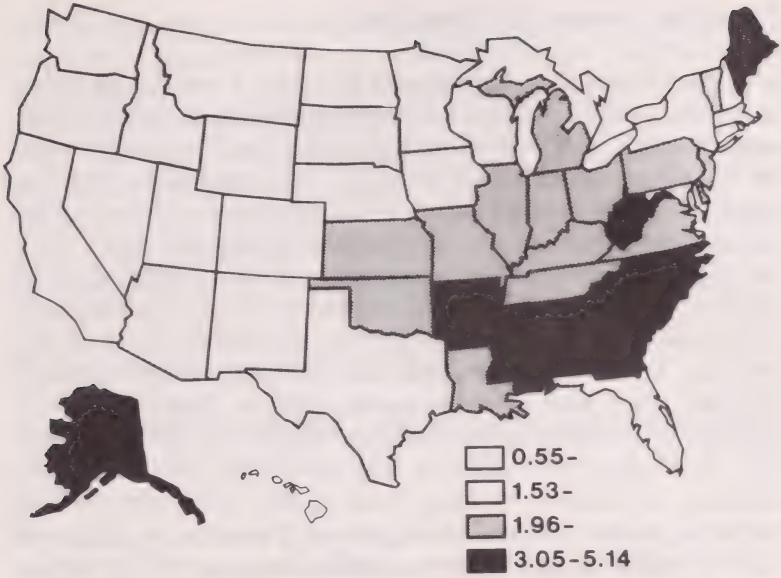

Figure 9.5. Death Rates from Housefires by State, per 100,000 Population, 1977–1979.

other causes of injury, are especially prominent in rural areas. A map of motor vehicle occupant death rates shows that there is a strong inverse relationship between population density and death rates. Many factors contribute to this inverse relationship. One of the most important is probably the availability of trauma care, both emergency care and definitive care for injured people. This relationship seems to hold true whatever the cause of injury.

In the case of motor vehicle crashes, additional important factors include greater speed of travel in rural areas. Such data raise the question as to the advisability of having higher speed limits on rural interstates, which have higher death rates than the urban interstates (6). Also important are the types of vehicles driven in rural areas, where utility vehicles that may be especially prone to rolling over are more likely to be used. We see much higher death rates from rollover crashes in the rural mountain West than we do in the rest of the country (2).

Providing "Automatic" Protection

The idea of passive protection is not new. Long before industrialization would put prevention at such a high premium, Leonardo da Vinci, in his notebooks, declared that "houses intended for dancing or any kind of jumping with a multitude of people must be on the ground floor; for I have already witnessed the destruction of some, causing death to many persons." Automatic protection is needed because the people most likely to be involved in crashes or other injurious events are the least likely to take advantage of ways to protect themselves, such as seat belt use. Drivers 16-to-24 years old, for example, are less likely to fasten their seat belts than older drivers. Similarly, drivers who are involved in higher speed crashes are less likely to fasten their seat belts. The same is true of drivers who have been drinking, of drivers running traffic lights, of drivers who are tailgating other cars on the highway. Virtually any high-risk driving behavior that has been studied in connection with seat belt use has proved to be associated with less frequent use of seat belts.

Because people who are at high risk of being injured are also unlikely to take active steps to protect themselves or other people against injury, we must place greater emphasis on automatic forms of protection. Examples of automatic or passive protection that we take for granted are such things as fuses in our homes that automatically protect us — day or night, asleep or awake, drunk or sober — against overloaded circuits and the fires that might result. Less common, but already well proven, are automatic sprinkler systems in homes, and air bag systems which give automatic protection in frontal car crashes.

We have seen dramatic changes in injury and death rates as a result of several forms of automatic or passive protection. Except for farm machinery, during the past half-century machinery has been increasingly required to protect the user with guards and other forms of automatic protection. As a result, there has been an approximately 80 percent reduction in death rates from nonfarm machinery in the past 50 years; during the same period, however, there has been a dramatic increase in death rates related to farm machinery. While it might be argued that there are many more farm machines in the United States now than there used to be, the same can be said of nonfarm machinery. Only

one reason explains the tremendous difference in trends in death rates from the two types of machinery: farm machinery has generally been exempt from stringent requirements that would automatically protect all users.

Still another, dramatic example of the effects of automatic protection was seen when the carbon monoxide content of domestic stove gas was reduced to nontoxic levels. There was more than a 95 percent reduction in both unintentional deaths and suicides from carbon monoxide poisoning (2).

A National Disgrace: What We Tolerate

The subtitle of this chapter, "A National Disaster," might equally well be "A National Disgrace." Consider some of the circumstances we tolerate:

- Scalding hot water temperatures in residential facilities for the elderly. In one such apartment I tested the water at 180°F.
- Sliding boards so high that serious injury is likely if a child falls from the top. Yet we send our youngsters up with an admonition to "be careful and don't push."
- Steering wheels in big trucks that often cause abdominal injuries and seem almost guaranteed to inflict injury if the driver is in a frontal collision. Yet the driving compartments of these vehicles have not been redesigned with energy attenuating steering columns, air bags, or other forms of protection for the driver (7).
- Glamorous public areas that are designed without regard to the potential for falls and drownings.
- Death rates from house fires that have changed very little in the past 50 or 60 years, reflecting our lack of emphasis on less flammable materials, easy escape routes, and sprinkler systems. Cigarettes, the ignition source in about 40 percent of all house fires, for example, can be designed so that their potential to ignite bedding and furniture is greatly reduced. Accordingly, they are the subject of federal legislation requiring "fire-safe" cigarettes.

A few years ago, when six or seven people died in an "epidemic" of Tylenol poisoning, it took only a few months for

ers to respond with tamper-proof packaging. It was an interesting lesson in what can be achieved in support of the idea of public protection — once the public and the manufacturers are both sufficiently concerned.

Conclusion

The Tylenol incident may provide a clue as to how to approach the matter of protecting the public. The apparent randomness of risk in the matter promoted public arousal. Anyone could be affected. The manufacturer, similarly, was roused to action in both the public interest and enlightened self-interest. Can auto manufacturers, or cigarette producers, be aroused in like manner — or will minimum fixes and halfway measures continue to substitute for definitive action, even when the technical means are already available?

There is also the question of public concern over risk that is all too predictable, indeed, all too predictably maldistributed. Can we bring ourselves to view the rates of suicide and homicide among certain groups as key public health problems, when many of these groups lack the political power that is often a requisite for social change? I must conclude with more questions than answers.

Yet the picture may not be totally bleak. Vigorous, charismatic leaders can achieve a new consensus for social change. All the problems discussed in this chapter can be addressed with available measures. Dollars will have to be spent. But the history of public health is replete with examples of measures for which, after prolonged and spirited debate, a consensus was indeed hammered out. Vaccination against infectious diseases, pasteurization of milk, and programs to combat drug abuse all represent milestones in achievement of public health consensus. Can a national campaign against trauma be far behind? Can a national campaign against trauma be *this* far behind?

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Chapter 10

Violence Is a Public Health Problem

MARK L. ROSENBERG

Violence, defined as the use of force with the intent to harm oneself or another, is an important public health problem. The Centers for Disease Control (CDC) conducts research on interpersonal and self directed violence and develops preventive interventions through its Intentional Injuries Section in the Division of Injury Epidemiology and Control, Center for Environmental Health and Injury Control (figure 10.1). Although not considered a traditional public health problem in the past, the CDC views violence as a priority among public health problems now because it takes a huge toll in terms of morbidity and mortality,

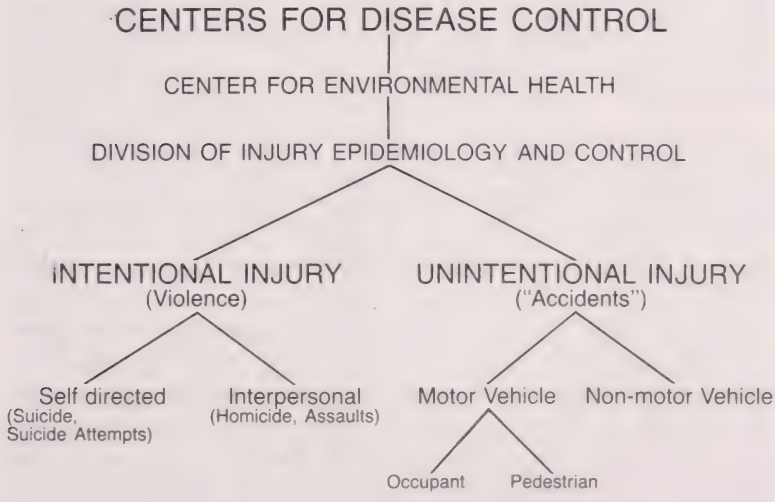

Figure 10.1. Centers for Disease Control, Injury Control Activities.

it cannot be resolved by the criminal justice sector alone, and because violence, like smallpox and many other infectious diseases, is a problem that can be addressed and perhaps prevented through the application of epidemiological methods.

Epidemiological analysis can clarify patterns of violence; and these patterns, in turn, lead to preventive interventions. Homicide and suicide are examples of interpersonal and self-directed violence. Because they are fatal outcomes, we can use death certificate data to identify demographic, temporal, and spatial patterns in suicide and homicide victimizations. Nonfatal assaults and suicide attempts are also important problems, but the data available on them are limited. The patterns that emerge from epidemiological analyses of homicides suggest that most homicides occur among young males who frequently are members of minorities and who usually know the perpetrator. These homicides are usually not felony-related, are usually intraracial, and usually involve firearms. Homicide rates are highest in large cities, and, for both blacks and whites, they are highest in the West. In most respects, homicide patterns are similar for blacks and whites.

Public health strategies to prevent homicide should be evaluated. They should include programs to decrease the cultural acceptance of violence; teach nonviolent conflict resolution skills; reduce injuries from firearms; improve the treatment of victims; and link police, health, and social service responses to violence.

Epidemiological analyses of suicide data have identified important increases in suicide rates of youth over the past 30 years. The rates are much higher for young, white males and frequently include young people who, by clinical criteria, are not depressed. Clusters of suicides grouped in time and space suggest that "contagion" and exposure to suicide may be important factors in suicide of youth. A variety of strategies to prevent these suicides have been suggested — including affective education, early identification and treatment, school-based screening, crisis centers and hotlines, improved treatment of depression, and restriction of access to the means of suicide — but we do not know if these strategies work. A community public health approach to prevent youth suicide would focus on developing a planned response to the suicide of a young person in the community. This plan should involve ways to identify high-risk youth through friends, teachers, suicide attempts, and family histories;

TABLE 10.1. Probability of Lifetime Murder Victimization.[a]

	Probability	Relative risk
White female	1 out of 450	1
White male	1 out of 164	2.7
Black female	1 out of 117	3.8
Black male	1 out of 28	16.1

[a]Source: Uniform Crime Reports, 1981.

it should identify community counseling resources and a spokesperson for the community.

The Public Health Toll of Violence

We say "violence is a public health problem" to emphasize three aspects. First, violence takes a huge toll in our society in terms of morbidity and mortality. Suicide is the eighth leading cause of death, and homicide ranks eleventh (1). For young black males aged 15-to-24, homicide is the number one cause of death. In individual terms, the statistics are even more striking. The lifetime probability of homicide victimization for a baby born in the United States in 1981 was 1:450 for a white female baby, and 1:28 for a black male (table 10.1) (2).

There are many ways to measure the toll; each way imparts its own bias and makes a different point. Ranking health problems by their standing as an overall cause of death fails to take into account the age at which people are dying from that problem. A better measure of the public health importance of a particular problem would be an indicator of the potential years of life lost because of that particular problem. For example, if we arbitrarily set 65 as the average length of a productive life, then a death at age 64 would result in the loss of one year of productive life; a death at age 20 would result in the loss of 45 years of potential life. When calculated in terms of years of potential life lost (YPLL), homicide ranks fourth, and suicide fifth (1).

Economic cost is another increasingly important measure of the toll a health problem takes on our society. Among young persons 15-to-24 the direct costs and lost earnings due to suicide

TABLE 10.2. National Economic Impact of Youth[a] Suicides, 1980.[d]

Number of deaths	YPLL per death[b]	YPLL total
5,239	41.5	217,420
	Economic Costs[c]	
Direct costs	Lost earnings	Total costs
$5,590,000	$2,261,320,000	$2,266,910,000

[a] Youth = Ages 15–24
[b] YPLL = Years of potential life lost (up to age 65)
[c] In 1980 dollars. Lost earnings discounted to present value at 4% per annum
[d] Source: Weinstein et al., Economic impact of youth suicides and suicide attempts. Task Force on Youth Suicide, Department of Health and Human Services, 1988.

and suicide attempts were estimated to be 2.3 billion dollars in 1980 (table 10.2) (3).

We focus on fatal events only because, at this point in time, we have better data for fatal events. Because of their greater incidence, however, nonfatal outcomes of self-directed and interpersonal violence may represent a problem of even greater social, economic, and political importance. In addition, physical injuries are just one type of nonfatal outcome. Traditional public health approaches have failed adequately to count and evaluate psychological injuries and disabilities, thus increasing the chance that the psychological costs of violence will be inadequately counted and subsequently undervalued. These costs may range from the often disabling depression among family members of homicide and suicide victims, to the lifelong psychological scars left on women and children who are victims of sexual abuse, to the individual and societal costs of exposure to violence, and the subsequent perpetuation of the cycle of violence. Clearly, we need a better method for taking these costs into account.

We also conceptualize violence as a public health problem because it will not be be resolved by the criminal justice sector alone. Traditionally, responsibility for a societal response to interpersonal violence has been left to the criminal justice system. But despite the efforts of law enforcement, judicial and penal personnel, homicide has climbed higher on the list of leading causes of death. Our reliance on police to stop homicide is based on our fundamental misconception that most homicides occur in the course of another crime being committed. We think of homicide as the unfortunate result of, say, a robbery that just

happened to take the life of an innocent bystander who was in the wrong place at the wrong time. But most homicides do not occur in association with any other crime or felony: they usually involve acquaintances getting into a disagreement that escalates. The Federal Bureau of Investigation each year points out that homicide is a social problem over which law enforcement has little control, given that more than 50 percent of victims and perpetrators had known each other before the event (2).

Solving the problem of violence will require an interdisciplinary approach. It will require the use of sociology, criminology, economics, law, public policy, psychology, and anthropology. We need to develop a common language and terminology, drawing on these disciplines, for defining and describing violence. Mutually agreed-upon definitions and the consequent generation of compatible data sets would greatly facilitate effective multidisciplinary cooperation. Currently, different disciplines, different agencies, and different national, state, and local jurisdictions use different definitions for terms such as *homicide, assault,* and *rape;* and there is tremendous geographical variation in case ascertainment and reporting. To effectively implement these new programs, health workers must actively build bridges with service delivery institutions outside the bounds of traditional health agencies, including community-based services such as shelters for battered women and rape crisis centers, as well as services supported primarily by criminal justice and judicial or social service agencies.

When we say that violence is a public health problem, we make the point that it is a problem that can be resolved, that it is not an unalterable fact of life. Here the emphasis is on the word *problem,* and it reflects our personal and public health belief that our actions can bring about change for the better (William Foege, personal communication, April 1988). Many skeptics point out that homicide has been taking a large toll among young American blacks for a very long time. That shows, they say, that homicide is just a fact of life, and one cannot do anything about it. Suicide, too, they point out, has been a problem for thousands of years, and it, too, is just a fact of life.

I disagree strongly with these opinions. Consider what happened with smallpox. In Asia and Africa, countless people are walking around with the scars of this disease; until about 20 years ago, smallpox took the lives of tens of thousands of people

each year. For millions of people, smallpox was a fact of life; now it no longer exists. Infantile diarrhea is, for many other people, another fact of life. Many women in developing countries lose several of their children in infancy from diarrheal diseases and dehydration. In those parts of the world, it is common to encounter a mother who will tell you that she had six children but lost five infants and now has only one surviving. To her, death from infantile diarrhea is just a fact of life. In the United States, it is almost unheard of for an infant to die of infantile diarrhea. Health problems that were facts of life for people at certain times and places are, for us, problems that have been resolved. This is what we mean when we say that homicide and suicide are public health problems: they are problems that we can and will resolve.

Many people remain skeptical of our ability to prevent homicide and suicide. They believe that what we need is a vaccine against violence, similar to the vaccines that we have to protect us against infectious diseases. This leads to a fallacious chain of reasoning: violence is not an infectious disease, so we cannot develop a vaccine for it. If we are unable to develop a vaccine for it, we cannot prevent it. If we cannot prevent it, why even try to study it?

The example of tuberculosis (TB) control reveals the fallacy of such reasoning. Figure 10.2 shows a marked decrease in the incidence of respiratory TB in England and Wales, but the figure does not show when this decrease occurred. To estimate the time scale for this figure, we should know that it was not until around 1945 that effective antimicrobial therapy was developed for treating TB, and it was around the same time that a preventive vaccine for TB was developed. Knowing this, most people guess that the decrease in respiratory TB began shortly after these magic bullets began to be widely used, about 1950.

Yet as figure 10.3 shows, the marked decline in respiratory TB rates began more than 100 years before these "magic bullets" were even developed (4). By 1945, in fact, the greatest decline had already occurred. What brought about this decline was first an understanding that poor nutrition, poor sanitation, poor housing, and overcrowding all contributed to the spread of TB, and then that understanding led to interventions to address these underlying conditions. The magic bullet was not necessary to initiate this train of events. In the same way, by using epide-

Figure 10.2. Respiratory Tuberculosis: Mean Annual Death Rates.

miological analysis to clarify the underlying patterns for violence, we can design interventions based on our understanding of these patterns. Patterns of homicide and suicide can illustrate this approach.

Homicide Patterns

The patterns of homicide victimization have become clear through studies in which national, state, and local statistics have been examined (5,6). Most victims of homicide are males, and homicide rates are highest among young males in the age range of 25-to-34 years. Most homicides do not occur in association with any other crime; they arise out of arguments that escalate between people who know one another. Most homicides involve family members or acquaintances; usually the victim and perpetrator are of the same race.

Racial and ethnic minorities have disproportionately high rates of homicide (7). Results of many studies suggest that homicide rates are strongly correlated with poverty and low socioeco-

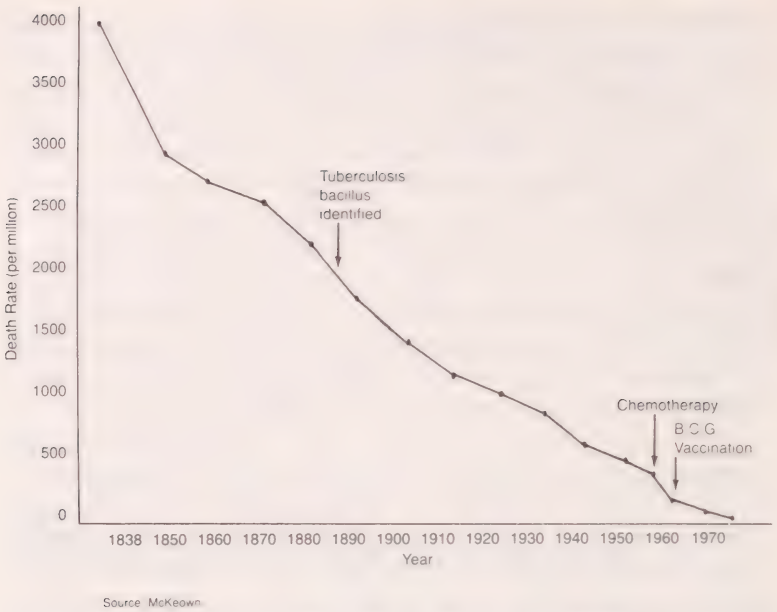

Figure 10.3. Respiratory Tuberculosis: Mean Annual Death Rates and Points of Intervention.

nomic status. When researchers have compared homicide rates in blacks and whites for groups with the same socioeconomic status, the rates for the two groups have been almost equal. Homicide rates are highest in what has been termed the "homicide belt" of southwestern and southern states, but this reflects the higher concentration of poverty and minority groups in these states. When analyzed separately for both whites and blacks, homicide rates are highest in the western states (8). Rates are also higher in urban areas and large cities.

The weapons most frequently involved in homicides are firearms, usually handguns. Alcohol is involved in approximately half of all homicides—consumed by the victim, perpetrator, or both. There are differences in the pattern of homicide victimization for different racial and ethnic minorities, but it is impressive that, in terms of major characteristics, homicide patterns for blacks and whites are strikingly similar (7).

Importantly, information that can help us understand and prevent homicide also comes from studying the patterns of nonfatal assaults. Although we have more complete descriptive in-

formation about fatal assaults, nonfatal assaults occur much more frequently, and, in terms of social and economic costs, they represent a problem just as important as homicide. Spouse abuse, for example, may be the most important cause of injury to women. A large part of the problem lies in accurately identifying spouse abuse — or, for that matter, an intentional injury — as the true cause of the trauma. Police records are notoriously inaccurate as indices of intentional injury; police reports probably account for no more than one-quarter of all intentional injuries that are identified in hospital records (9).

Even hospital records undercount intentional injuries. By using a carefully constructed set of criteria to identify women who had been battered, researchers at Yale-New Haven Hospital found that spouse abuse accounted for more injuries to women than rape, muggings, and automobile injuries combined (10). Since nonfatal violence often precedes fatal violence, understanding the determinants of nonfatal violence may suggest ways to intervene and prevent these intentional injuries before they escalate to fatal levels.

One of the official 1990 health objectives for the nation is to reduce the homicide rate for young black men. Figure 10.4 shows that homicide rates for young black men have decreased markedly since their peak in the late 1970s, but these rates are still five times as high as the rates for white males in the same age group. In addition, although we think about homicide as a problem that predominately affects males, homicide rates for black women are higher than homicide rates for white men.

Although the prevention of homicide will require changes in the social conditions that contribute to violence, such as poverty and racial discrimination, we have identified several important strategies for preventing homicide through public health interventions. Most of these interventions are still being developed, and all need to be carefully evaluated before they are implemented on a large scale. The strategies believed helpful to prevent homicide include:

- Decrease the cultural acceptance of violence. Many elements of our culture, including the entertainment media, actively promote violence. Although the exact contribution of televised violence to actual violence is not yet clear, we need to

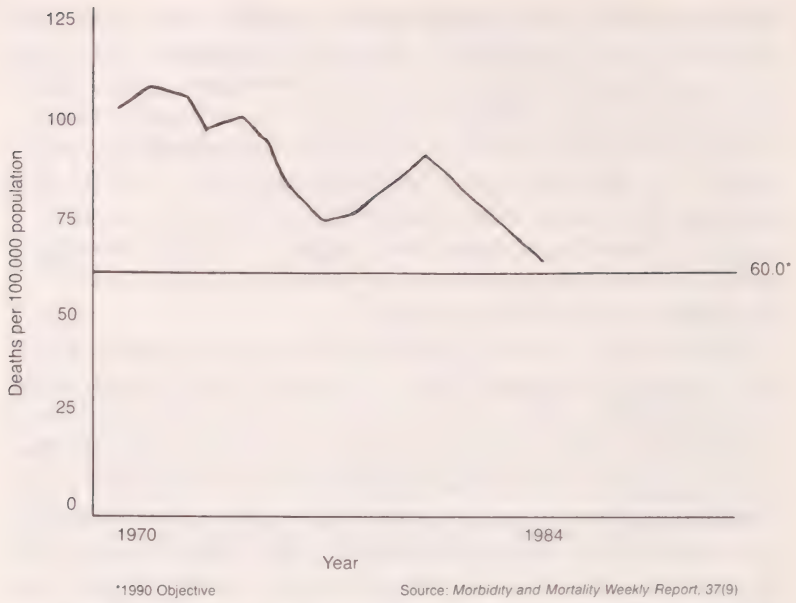

Figure 10.4. Black Male Homicides (Age Group 15–24) per 100,000 Population, United States, 1970–1985.

examine ways in which the media may contribute to, rather than help to prevent, intentional injuries.

- Teach nonviolent conflict resolution skills. One innovative program uses a high school curriculum to teach the consequences of violence; it uses videotaped simulations of fights to show how young people frequently provoke physical confrontations. The ultimate lesson from this course is that "it is better to be a chicken for a minute than to be dead for the rest of your life" (11).

- Develop a scientific basis for public policies to reduce homicide that is due to gunshot wounds.

- Improve recognition, management, and treatment of victims of violence. First we need to identify victims of violence. This is a difficult task because even those individuals who seek medical or psychological care or request assistance from social service agencies frequently do not state that their injuries were intentionally inflicted by another person. Once these victims

are accurately identified, we need to provide services that go beyond merely addressing their physical injuries. If they are only bandaged up and then sent back to the same environment, these victims will likely be injured again or, worse yet, killed. Comprehensive model programs for identifying and treating victims of violence have been developed and are ready for more widespread dissemination and evaluation (12).

- Link police, health, and social services' responses to violence. Victims and potential victims of violence frequently turn to one or more of these agencies for help; but since there is usually little or no communication among these different agencies, each one remains unaware of what the others are doing, and they do not coordinate their approach to the client. Even more importantly, because no one agency is aware of requests for help that the client has made to other agencies, one agency is frequently unable to identify the seriousness and urgency of the problem.

For example, a physician who sees a battered woman in the emergency room may respond differently to the patient's problem if he or she knows that the woman had previously sought help from the police, child protective services, and the local shelter for battered women. That information might help the physician realize that the patient was at high risk for becoming a homicide victim — but that information is not usually volunteered and is rarely available. One current study in Atlanta is examining whether combining information from various health, criminal justice, and social service agencies would help to identify persons at high risk for domestic violence so that preventive services could be selectively delivered to them (13).

Suicide Patterns

Two problems complicate the epidemiological analysis of suicide patterns. First, we want to know why the subject committed suicide, but the subject is no longer available to tell us, and frequently there is no one else who really knows the answer. To begin to answer the question of "why," we must reconstruct the deceased subject's frame of mind before the suicide by interviewing people who knew the subject. This process takes a lot of

time, effort, and skill; but the process, termed a "psychological autopsy," can provide very important data. The second complicating problem is the lack of uniform criteria for determining whether a death is or is not a suicide. Representatives from interested organizations have recently developed a set of criteria to help decision makers (primarily coroners and medical examiners) collect and use the type of information necessary to make the classification of suicide more accurate and reliable throughout the United States (table 10.3) (14).

Although suicide has not been traditionally considered a public health problem, the Department of Health and Human Services and the Public Health Service have placed a high priority on developing effective public health approaches to preventing youth suicide. Within the Public Health Service, the main responsibility for basic suicide research falls to the National Institute for Mental Health and, for epidemiological research and preventive services, to the Centers for Disease Control. This priority reflects recent changes in the patterns of suicide in this country and a traditional public health focus on preventing those health problems that take a large toll in terms of lives and years of potential life lost. From 1950 to 1980, suicide rates among young persons in the United States increased markedly. They increased most dramatically among young white men: rates among white males aged 15-to-19 increased by 305 percent; among white males aged 20-to-24, by 196 percent. Suicide now represents the second leading cause of death among young persons aged 15-to-35. In 1983, suicide was the fifth leading cause of years of potential life lost in the United States. In 1980, for the first time, more than half of the persons committing suicide in the United States were under 40 years of age (15).

Recent attention has also focused on clusters of suicide among young people (16). These are suicides that are grouped together in a particular place (such as a community or school district) and occur within a relatively short period of time. Suicide clusters have been known to occur for many years, and apparent clusters of suicides have been reported from many areas of the United States (17). Unlike clusters of diseases such as measles or smallpox, clusters of suicides are not a condition legally reportable to the health departments, so we do not know how frequently they occur, what proportion of all youthful suicides might occur in

TABLE 10.3. Operational Criteria for Determination of Suicide.

I. **Self-Inflicted:** There is evidence that death was self-inflicted. This may be determined by pathological (autopsy), toxicological, investigatory, and psychological evidence, and statements of the decedent or witnesses.

II. **Intent:** There is evidence (explicit, implicit, or both) that at the time of injury the decedent intended to kill himself or herself or wished to die, and that the decedent understood the probable consequences of his or her actions.

A. Explicit verbal or nonverbal expression of intent to kill self.

B. Implicit or indirect evidence of intent to die, such as the following:

- Preparations for death inappropriate to or unexpected in the context of the decedent's life.
- Expression of farewell or the desire to die or an acknowledgment of impending death.
- Expression of hopelessness.
- Expression of great emotional or physical pain or distress.
- Effort to procure or learn about means of death or to rehearse fatal behavior.
- Precautions to avoid rescue.
- Evidence that decedent recognized high potential lethality of means of death.
- Previous suicide attempt.
- Previous suicide threat.
- Stressful events or significant losses (actual or threatened).
- Serious depression or mental disorder.

These criteria were developed by a working group of persons representing the Academy of Forensic Sciences, American Association of Suicidology, Association for Vital Records and Health Statistics, Centers for Disease Control, International Association of Coroners and Medical Examiners, National Association of Counties, National Association of Medical Examiners, and National Center for Health Statistics.

clusters, or whether the frequency of suicide clusters has increased in recent years.

One explanation for why clusters occur involves the notion of "contagion," the idea that suicide may spread among some young people who are "exposed" to suicide either directly or indirectly. Direct exposure may occur through a friend's or classmate's suicide; indirect exposure to suicide may occur through news reports, books, movies, or discussions. Although our understanding of suicide contagion is incomplete, some evidence suggests that indirect exposure to suicide through print and broadcast media might lead some susceptible individuals to commit suicide (6). Either form of exposure may lead a susceptible youth to commit suicide, perhaps imitating or copying the initial suicide by choosing a similar method and setting. Individuals may be affected by exposure to a suicide in proportion to the degree to which they identify with or feel themselves similar to the initial suicide.

At the same time that suicide among youth is being recognized as a serious public health problem, questions are being raised about the effectiveness of traditional approaches to suicide prevention (18). The Task Force on Youth Suicide convened by the Secretary of Health and Human Services recently has completed an almost two-year review of what is known about youth suicide risk factors, interventions, and strategies for prevention. The traditional mental health approach to suicide prevention was based on the notion that the typical person at risk for suicide was an older, clinically depressed male. In that approach, suicide would be prevented by identifying older, depressed males and treating their depression. However, recent evidence suggests that not only are most suicide victims now young, but in addition most do not meet traditional medical criteria for a diagnosis of depression. The other widespread approach to suicide prevention has been through suicide prevention centers or crisis intervention units. The effectiveness of these and other preventive services or educational efforts has, however, not yet been fully evaluated. Additional approaches to suicide prevention that also need to be evaluated include programs designed to improve the identification and treatment of depression, manic-depressive illness, and substance abuse; programs to evaluate different treatments for suicide attempters; programs to identify other individuals at particularly high risk of suicide; and programs to reduce access to lethal means of suicide.

Public Health Interventions for Youth Suicide Prevention

Although much more basic research needs to be done and all of the approaches to youth suicide prevention urgently need to be evaluated, the Public Health Service believes that several basic principles of preventive health can be usefully applied to this area (19).

A plan for how the community might respond to a young person's suicide should be developed before a crisis occurs. The knowledge that the subject has been discussed and a plan prepared can, in and of itself, relieve the sense of panic and fear that might otherwise come over school or community officials. Since there is no proven effective intervention plan, each community should prepare its own response, taking into account its own needs and resources.

Communities are frequently barraged by so-called suicide experts after youth suicides have occurred. These "experts" frequently have strongly-held beliefs about what kind of program would be most effective in preventing more suicides of youth. For example, some experts advocate blitzing the community with more discussions and information about suicide. These are directed at children, school staff, parents, and the community at large. Other experts counsel a diametrically opposite approach — that of keeping things quiet, drawing as little attention as possible to the deaths and to the topic of suicide. They argue that more attention drawn to the subject will only increase the risk of "contagion" and result in additional youthful suicides.

Since neither approach has been adequately evaluated, the community should develop its own approach, being aware of the current state of knowledge and drawing up its plan under noncrisis conditions. First, the plan should include a procedure for identifying young people considered at high risk for suicide. These people might be identified by teachers, guidance counselors, parents, peers, police, mental health professionals, and hospital emergency room personnel. Persons thought to be at high risk include close friends of the person who committed suicide; young people with a history of suicide threats or attempts, or a family history of suicide attempts or suicides; young people with serious drug or alcohol abuse problems; young people with a history of serious emotional problems; people who

may be likely to identify with the deceased; and young people who may be socially isolated or without emotional supports. The plan should specify clear and simple procedures for locating and treating these young people at high risk. Listings of mental health services and providers should be widely available.

Second, the plan should identify and assess community resources: who is available (such as local or state mental health and public health officials) to work with school authorities? Who is available (such as therapists, psychologists, psychiatrists, guidance counselors) to counsel high-risk students? Who can counsel the surviving family members? If a crisis should occur, which individuals or representatives (such as the mayor or administrator, superintendent of schools, PTA president, mental health clinic director) should serve on a coordinating task force? Is there an existing facility that could provide immediate crisis counseling through a 24-hour hotline and walk-in clinic?

Third, the plan should identify an individual who will act as a spokesperson for the school or community. This individual should be responsible for handling all interactions with the media and for providing accurate and timely information to concerned parents and community members. This is an important function; it is necessary to obtain and sustain community support for this coordinated approach to the media. The plan should also identify responsible individuals at organizations such as schools, hospitals, and police agencies. Accurate information is crucial because active rumors are incendiary.

There are no clear-cut guidelines for media coverage of suicide because we do not yet know the effects of different types of media coverage on subsequent suicides of youth. Inevitably, the media will be interested in presenting the information about these suicides to the public. Besides creating the risk of "contagion," unguided media coverage can contribute to a community dividing against itself. During a community response to a crisis, individuals will frequently disagree with the response that a teacher, school system, or a task force has chosen to adopt. Individuals tend to look for someone to blame for what went wrong. These are normal feelings that can be directly addressed and resolved.

These feelings can become inflamed and newspaper reports can become inflammatory if the dissatisfied individuals start using the media to wage their battles. Media representatives can

be inordinately intrusive upon the lives of shocked and grieving students and parents. Some school authorities, for example, might want to protect students from unreasonable requests for interviews by barring reporters from school grounds. In addition, media coverage during a crisis is rarely considered and balanced to the extent that the community might wish. After the crisis, when there is greater likelihood of accurate in-depth coverage, the reporter or publisher may no longer be interested in this issue.

The plan should acknowledge the importance of not romanticizing in any way the young person or her or his tragic death. Activities that might be seen as romanticizing the suicide increase the likelihood of other young people committing suicide through the mechanisms of identification or imitation. Unfortunately, during the period of acute mourning and grief, when the community is under maximal stress, most individuals tend to describe and remember the good qualities of the deceased. They are reluctant to attribute serious problems to the individual who committed suicide, either because of denial or guilt, or out of respect.

What often emerges, then, during the immediate crisis period is a one-sided, romanticized portrait of the individual or individuals who committed suicide. This is frequently the account carried by the media. Wakes and elaborate funerals can perpetuate the romantic view of the individual. In appropriate cases, it may be helpful to acknowledge that the deceased was someone who had very serious problems — for example alcohol abuse or serious mental illness — that set her or him apart from most other young people, and that these problems have better solutions than suicide.

Toward Control of Intentional Injuries

For reasons that are unclear, intentional injuries do not get their proportional share of attention in public health research. Thus, there is a paradox: intentional injuries are a large part of the injury problem, but they receive a disproportionately small part of injury researchers' attention. This anomaly parallels what the National Academy of Sciences states in "Injury in America": injury is the number one public health problem in the United

States, but it gets a disproportionately small part of the public health resources and attention (20). Each area discussed in "Injury in America" — epidemiology, prevention, biomechanics, acute care, and rehabilitation — relates to important questions about intentional injury.

In the epidemiology of injuries, the most fundamental need is for a common vocabulary that can serve a diverse set of professionals working together on a multidisciplinary endeavor. If police are to work with sociologists, and prosecutors with physicians, they must all speak a common language. Those in this field will have to work hard to achieve clarity. For example, there is no clear agreement on what the term *suicide* means. Because people use vague and ill-defined criteria to classify suicides, experts estimate that our national statistics may be missing as many as 50 percent of actual suicides. Also needed are definitions of terms as basic as *violence*. Death certificate classifications reflect the disagreement on whether the category of "accident" is to be included with "homicide" and "suicide" as a violent death. For nonfatal categories, there is even more disagreement. Another common "language" that has been proposed is the language of dollars. Many observers have noted that if any progress is to be made in the United States in this field, researchers need to be bilingual: fluent in dollars as well as in English. Workers in this field need to be able to put price tags on injuries and their resultant losses.

In the epidemiology of intentional injury, we also need to focus on large-scale social factors such as racism, sexism, segregation, and poverty. Numerous studies have linked these factors to violence. We must remember that the burden of intentional injury is inequitably borne in U.S. society. The statistics we adduced near the beginning of this chapter show clearly how much more likely it is that a black male baby will be murdered in the course of his lifetime than a white male baby; that white male in turn is almost three times as likely to be murdered as a white female infant (2).

Because certain communities of racial and ethnic minorities are so disproportionately involved in intentional injury events, those communities and their representatives must participate in planning and implementing programs to prevent intentional injury. Minority researchers, program planners, and practitioners working in the area of intentional injuries are extremely scarce.

More support for them is also needed, as are resources and incentives for recruiting qualified people to work in this area.

Other epidemiological factors that may be particularly germane to intentional injuries are biological: what are the biochemical-neurophysiological bases of violence and aggression? For example, some research suggests that the absence or presence of certain neurotransmitters such as serotonin makes a big difference in human behavior.

Prevention

There is a pressing need for a planned approach to preventing intentional injuries. In one project to prevent youth suicides, researchers polled experts about the effectiveness of several interventions. The interventions included education, early identification and treatment, school-based screening, crisis centers and hotlines, improved treatment of depression, and restriction of access to the means of suicide. The researchers estimated the cost of each intervention and produced a list of the most cost-effective interventions. The results of the poll show that the experts did not agree on the effectiveness of any intervention, because the data necessary to estimate effectiveness did not exist.

The National Highway Traffic Safety Administration (NHTSA) has spent about $100 million to study motor vehicle impact biomechanics (Michael Finkelstein, associate administrator, Research and Development, NHTSA, personal communication). How much money, if any, has been or will be spent studying the biomechanics of bullet injuries? There is an epidemic of homicide in Detroit. Perhaps researchers at Wayne State University, an institution where much has been done to examine impact biomechanics, could look at firearm injuries during the epidemic in their own backyard.

Health care workers in emergency rooms need to pay attention to the psychological as well as the physical state of patients with bullet or stab wounds and other intentional injuries. How can their psychological as well as physical needs be addressed both immediately and during the process of rehabilitation that continues well after the event?

Rehabilitation for victims of intentional injury may also require special attention to psychological injury that is not apparent from an examination of the physical injury. The psychological impact of intentional injury may be analogous to the "hidden" aspects of head injury; health care providers may not "see" anything, but the person may be brain injured or brain damaged in subtle ways that can make his or her life a nightmare.

Finally, rehabilitation following intentional injury must include the rehabilitation of the perpetrator. What kinds of detention, deterrence, or education will work, for whom, and under what circumstances? The staff of the CDC Division of Injury Epidemiology and Control believes that answers to questions of this sort will be vital in the 1990s and beyond, as we begin proactively to assess and prevent all forms of violence.

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sectors, including local government, school systems, and crisis centers; the medical community; mental health organizations; university research programs; and state and federal public health agencies. Also participating in that workshop were representatives from the National Institutes of Mental Health, the Indian Health Service, the American Association of Suicidology, and the Association of State and Territorial Health Officials. On the basis of ideas from this workshop, recommendations were developed for a plan that community leaders could implement to prevent or contain suicide clusters. Those recommendations may differ slightly from the discussion in this chapter. See the CDC Recommendations for a Community Plan for the Prevention and Containment of Suicide Clusters, *Mortality and Morbidity Weekly Report (Supplement)*, 1988, (in press).

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Chapter 11

Care of the Injured in America: Organizational and Physiological Considerations

G. TOM SHIRES

A recent study from the National Academy of Sciences, regarding injuries in America, revealed that the number of productive years of life lost from injury, compared to cardiovascular disease and cancer, is staggering (1). Yet federal expenditures for research in injury control are quite small: one-tenth that for cancer and less than one-fifth that for heart disease and stroke. This discrepancy between the magnitude of the problem and the resources devoted to it was first pointed out in a National Academy panel in 1968 in its study, "The Neglected Disease of Modern Society: Accidental Death and Disability" (2). The situation has not changed much since then. The National Institutes of Health (NIH) expenditure for injury control research is still less than 2 percent of the total budget, that is, $34 million out of a $6.2 billion NIH budget (3). Injury thus remains a neglected disease of modern society, an epidemic that we are not adequately addressing.

Examination of the problem in more specific statistical terms indicates that injury is indeed the primary public health problem in the United States. If burn injuries are included in the count, the additive impact of the variety of injuries that occur becomes clear. We have seen that when care becomes available, patients will make use of it. A case in point is the New York Hospital-Cornell Medical Center's burn center built in New York in 1976, which is now treating well over a thousand patients annually. The costs of such facilities are high and are borne in large part by the community. Vehicles for distributing this fiscal burden

include investment on the part of the hospital, volunteer groups, reimbursement (inadequate although it may be) for the institutionalized part of burn injury treatment, and other sources. Support of such a center requires strong community effort as well as the many dedicated personnel needed to care for patients who tend to be at the upper end of the trauma scale.

The results of such care are good: thirty years ago, a 35 percent total body surface area burn produced a mortality rate of 50 percent. Today, if the patient receives care at a burn center such as New York-Cornell, it takes a 78 percent total body surface area burn to produce the same mortality rate. The improvement is the result of intensive medical care, antibiotic therapy, and other treatments—all of which combine to improve survivorship of badly injured people.

Resources for Injury Care

One proof that injury care is underfunded is that there are only three nonmilitarily-funded burn centers in the entire United States. These are funded not on their patient care capability but on their research capability. As is evident from the example of burn injury patients, trauma injury in general tends to require high-level and standardized care, so that the results of the research done at the center are reproducible in other centers. Care and research must go hand in hand for either to advance significantly. Yet the peer review and funding of these centers come largely from people not at all familiar with the problems of trauma. Consequently, the national outlook is woefully inadequate.

How is the medical establishment addressing trauma? Efforts include a conjoint council giving financial support from major organizations around the country and working to increase the sensitivity and awareness of the NIH and other national forums to the urgency of improving care of the injured. Support is needed at all levels, from basic science to clinical science to direct patient care. Thus far, success has been meager. Since the effort began just a year and a half ago, there is hope that the eventual outcome will be useful.

Another effort grew out of a study, "Injury in America" (3), which recommended a Center for Injury Control (CIC) in the

United States; this has now been established and placed initially under the purview of the Centers for Disease Control. The CIC is charged with looking at trauma care across the spectrum from prevention through research and definitive care, including rehabilitation, and is the only center in the country covering the range of trauma care and research from epidemiology to rehabilitation. The start-up budget, coming from the Department of Transportation, was meager: $10 million initially, which does not allow for a large, wide-ranging, and concerted effort to address the problems of trauma. If Congress agrees in the future to increase the budget, preferably into the $100 million range, the CIC can broaden their activities to cover the entire spectrum of injuries.

Experiments in New York City

Transportation, initial care, definitive care, and research to improve care of the injured patient are four exigencies of burn injury treatment with which I am particularly concerned in this chapter. Twelve years ago, in New York City where the New York Hospital-Cornell Medical Center burn center was established, transportation systems for the injured and seriously ill were in great disarray. Fortunately, the Macy Foundation initiated a study of transport systems and emergency care of the city's injured and ill; this was at least a first step in analyzing the system's weaknesses and working to correct them (4). One finding was that minimum response time for ambulances was twenty minutes, sometimes as much as two hours.

As the country's largest and most populous city, New York has not only a huge demand for medical services but also a great many elderly and indigent people who are more likely to need emergency as opposed to primary care. Overall, there are about 650,000 calls for ambulances per year.

Not enough of the city's resources were channeled into emergency medical services at this time; consequently, the Macy Foundation outlined a comprehensive plan detailing the need for the city to own more ambulances, for trained technicians, for an emergency services director, and so on. This report provided the impetus for the formation of a mayor's advisory committee, with the necessary emergency services director. Over the years,

the improvements effected by this body have been numerous and dramatic. Ambulance response time is down to ten minutes or less, for all areas of the city. Emergency rooms are now recognized and categorized for emergency ambulance receiving. There is now one designated trauma center per half-million city residents, totaling ten, soon to be fourteen, approved trauma centers; there is also the burn center, and a spinal injury center. These services have all evolved within the last ten years because of intense and concerted effort among various branches of city government and medical centers, and their development is parallel to that occurring in other urban areas in the country.

The most important lesson emerging from this case, and from similar cases in other cities, may be that the effort to improve transportation must always be a local initiative, which, beyond programs providing matching funds, cannot be effected at the federal or state level but must be the result of a concerted local effort. Physicians frequently have been involved in such efforts. Most important is the presence of someone, or some persons, to provide the initiative, gather primary data, figure out where improvements are needed, and work out funding to set up new systems for initial emergency care.

Other areas that deserve attention are efforts to improve initial and definitive care of the injured patient. More research is necessary across different disciplines for such improvement to be possible; but in areas such as fluid and electrolyte control, much progress has been made. The Edwin Smith Surgical Papyrus, written most likely around 3500 B.C. and one of the oldest known written scientific documents, is a history of 48 injured patients described in thorough and accurate detail. It is evident that trauma, and methods of treating it, have been around for a long time. The Edwin Smith Papyrus aimed treatment of the traumatized patient at the wound: stopping bleeding with a tourniquet, direct pressure applied to the wound, pouring boiling oil on the wound—whatever it took to control the injury.

The Physiology of Trauma

Such has been the treatment strategy, in some form or another, since then, at least until the recent past. Hence the nineteenth-century physiologist Claude Bernard, in enunciating his concept

of the *milieu intérieur,* was prescient, since his concept implied that physicians were looking in the wrong place. He said that the stability of the internal environment is the primary condition for the freedom and independence of existence. In the mid-nineteenth century, with the advent of anesthesia and antisepsis, physicians caring for injured patients began to investigate the clinical dimension of Bernard's *milieu intérieur.* In the 100 years since then, there has been a remarkable increase in that activity, and it turns out that Bernard was, indeed, correct: the internal environmental changes resulting from trauma more strongly determine whether one lives or dies than the local care of the wound.

My colleagues and I have conducted studies on hemorrhagic shock, looking at what happens in the internal environment after trauma. We found that the extracellular fluid levels decreased more than we had expected from what normally goes to plasma refill (5). This raises the question of whether the trauma produced cellular injury that might have drained off some of the fluid into the injured cells, diverting it from plasma and capillary refill and thus producing shock. As a consequence of those studies, we began to examine the function of the cell membrane in shock. Most of the body's cells have a semipermeable membrane, a complex structure that functions essentially as a cellophane envelope across which a concentration gradient is maintained by active, oxygen- and energy-requiring work by the cell. The sodium-potassium pump, or membrane transport control, generates a measurable potential difference across the membrane.

One can thus measure what happens to the cell membrane under a variety of conditions, including trauma and shock. With a microelectrode, it is easy to measure the potential difference across a cell's membrane; we have found that there is a remarkable change in cell function in response to injury and hemorrhagic shock. Subsequent studies have demonstrated that the cell injury that occurs during hemorrhagic shock, although often significant and severe, can be quickly and effectively reversed (6). Glial cells and Betz cells in the brain, cells in the liver, and cells in other organ systems and body tissues are all similarly affected by trauma (7,8).

This led to the concept that a cell injured by shock would allow an inward leak of sodium, water, and chloride and an outward

leak of potassium. It does not take much cell swelling anywhere in the body to produce a remarkable loss of extravascular extracellular fluid internally. This is the case in hemorrhagic shock alone, without specific traumatic injury. Why this is the case is not clear; it may be a reduction in the function of the sodium-potassium pump due to the shock state, but there are times when it appears that there may also be an increase in sodium permeability.

This has led to the question of what third space sequestration is; for years it was thought that the third space was confined to a nonfunctional extracellular location. This notion may be incorrect. Movement into a nonfunctional, nonequilibratory space — a "nonturnover" or "third-space" phenomenon — will, for example, lead to a reduction in the amount of extravascular, extracellular fluid. Such a movement of fluid is well-known to occur in conditions such as ascites or infection. It also is seen in trauma.

Any insult that results in a localized collection of pericytic edema can be called third-space sequestration. With hemorrhagic shock without concomitant trauma, the reduction of interstitial fluid is due to draining off into a "third space" inside, not outside, of the cell (9). With burn patients, who require so much volume replacement for resuscitation, the tremendous reduction in their extracellular fluid may be caused by the fluid moving into both places: into an extracellular sequestered location but also into an injured cell mode. Research has shown this to be the case: not only does the fluid move into the injured cell at the burn wound, but it also does so, to a lesser degree, away from the burn wound (10). It is no wonder, then, that it takes 20 or 30 liters of an extracellular mimic to replace the fluid losses due to severe burns.

For patients with severe hemorrhagic shock from trauma, treatment also needs to be tailored. Therapy geared toward returning the blood that was lost but also replacing extracellular fluid will optimize resuscitation. Extravascular lung water in such patients will not rise. As the fluid lost to third-space sequestration returns and becomes functional, it will generally not overload the pulmonary circuit (11).

Monitoring has been an area in which great advances have taken place since World War II. It is most important to carefully pick the patients for closest monitoring. Patients with multiple injury, prolonged hypotension or transfusions, or preexisting

disease make up the 10 percent of trauma patients who need monitoring. The rest can be treated empirically based on the therapies I have outlined. Another area of research yielding much information is the relation of energy requirements to the degree of injury. The more severe the injury, the greater the energy demands, due to the hypermetabolism that occurs following various traumas, with burn being at the upper end of the scale (12).

Underestimation of energy needs is all too frequent, increasing the likelihood of mortality. Once a patient builds up a deficit of 10,000 calories, no matter how well the injuries are treated and the fluid electrolyte balance maintained, chances for recovery are slim (13). More data can establish more precise guidelines for calculating energy requirements of trauma patients and gearing therapy toward those needs. If we handle correctly the caloric requirements as well as initial fluid requirements of trauma patients, we can reverse each of the complications of injury.

Another form of injury is starvation alone: it produces measurable cell injury, which intravenous feeding, critical though it is, is slow in reversing (14). Why this is so is unclear. Measuring amino acids in the setting of a peripheral arteriovenous difference may tell us what the composition, blend, and rate of delivery of such amino acids should be. In the burn patient, for example, giving glucose intravenously leads to remarkable changes. But particular amino acids, such as glutamine, which is a bi-chain nitrogen receptor, enhance recovery. While one supplies the patient with fluid and calories, therefore, it is essential also to supply the protein building blocks that will keep the body running.

Immunologic response and its mediators are also affected by trauma, particularly by burn injury. There are a number of mediators that have been researched and described: the glucocorticoids, the leukotrienes, the prostaglandins, and even lipopolysaccharide or endotoxin itself have all been demonstrated to be immunologic mediating and activating factors (15,16). In the gross sweep of immunologic response to injury, lymphocytes are greatly depressed following burn and traumatic injury; this is almost entirely T- or helper-cell suppression. Cortisol levels in burn patients are high; administering cortisol to normal volunteers to produce similar plasma levels produces T-cell function depression to the same extent of that of the burn patients

(17). Cortisol, along with other mediators, causes a striking effect on lymphocytes. Such an immunological defect may determine whether a patient lives or dies following injury.

Septic Shock

One of the more fascinating areas of recent research has been examination of sepsis and septic shock. Over three-fourths of burn patients who die succumb to or at least had sepsis. Since 1943, we have characterized sepsis in detail: wide derangements in organ function, cellular homeostasis, inflammatory responses, energy metabolism, and so on — all of which can be completely reproduced by altering plasma levels of the mediators I have mentioned, without any endotoxin or lipopolysaccharide at all.

The substance cachectin was first isolated in animals, in studies of what caused rabbits to get cachexia and die when they had trypanosomiasis (18). Starvation states were also under study, and they were thought to be caused not just by caloric deficiency but by something else as well. Cachectin is a product that is made endogenously, in the macrophage, and that is triggered by injury and also by endotoxin or lipopolysaccharide. The macrophage making cachectin inhibits the lipoprotein lipase, causing fat not to be utilized and thus explaining the cachexia seen in malaria, trypanosomiasis, and other wasting diseases (19).

It was then found that the cachectin is synthesized internally in humans as well as in other animals (20). It is a protein of 152 amino acids, called a monokine or cytokine, that kills other cells in the body. As it is now available as a pure substance, it is possible to make a monoclonal specific antibody against it and further investigate it. It has a half-life of six-to-ten minutes, being rapidly excreted or degraded (21). Administering cachectin to an animal or patient makes it possible to reproduce completely all of the signs of septic shock without any actual sepsis (22). After one hour, one of the prostaglandins that is activated causes an upswing in temperature. Two hours later, a second temperature spike is caused by activation of interleukin-1 (23).

Cachectin thus causes specific and measurable changes in the body's chemistry and function, faithfully mimicking conditions

produced by sepsis. The hyperglycemia in response to sepsis can be quickly reproduced, as can the cell changes measured by glycogen washout or removal from the liver; across species the effective dosages vary, with rodents being more resistant and humans more sensitive to cachectin, but it is evident that the substance is made endogenously in every species studied and produces all of the effects I have mentioned. There appears to be a clear cause-and-effect relationship between the administration of the cachectin and the resulting cell injury.

It appears that cachectin turns on a number of functions, including the superoxides and amine release; it also turns on all the other mediators: the prostaglandins, interferon, interleukin-1 and -2, platelet-activating factor, C-5 (24). Once the cachectin is released from the macrophages in response to injury, the whole of the body's harmful system is activated. Administering a monoclonal antibody results in protection against cachectin and against all the symptoms associated with its activation.

To investigate further, we administered lethal live E. coli infusions to primates, to determine the effects, among other things, on cachectin levels. We compared standard treatment, including antibiotics, with specific monoclonal antibodies to see what happened to cachectin levels. The stress hormones, normally elevated in response to septic shock or, in this case live E. coli, were completely blocked by a single monoclonal antibody against cachectin; both epinephrine and norepinephrine were blocked, and the ability to mount a white cell response to infection, which normally is obviated in lethal endotoxin shock, was protected (25). The most impressive result was that all of the animals treated with the monoclonal antibody, in addition to conventional antibiotics, survived. None of the others was so lucky.

Sepsis and septic shock have killed and continue to kill many burn and trauma patients; now we know that we can prevent them by blocking the mediator involved. Other factors and substances are involved, but the discovery and isolation of cachectin, a primary, pivotal, proximal mediator of sepsis, has led to great advances in the treatment of endotoxin. If we can keep patients alive while we bring fluid levels, caloric needs, and bacteria under control, then we can prevent sepsis and septic shock, the most common causes of death in burned and traumatized patients.

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PART V

Concluding Views: Some Tentative Prescriptions

Chapter 12

The Spectrum of Health: Matching Medical Education to Medical Realities

ALVIN R. TARLOV

In the past decade, deliberations on medical education have centered, perhaps too narrowly, on the knowledge explosion, electronic mechanisms for information storage and retrieval, the diminished utility of in-hospital wards for education, the desirability of greater emphasis on outpatient sites, the liabilities of specialization of medical practice and teaching, a definition of primary care, the psychosocial dimensions of patient illness, the rapidly increasing supply of physicians and the consequences of an impending surplus, and the diminishing number of applicants to medical school. While these issues remain important, and are neglected at our peril, they pale in comparison to another exigency: the conceptual framework of physicians' work. This theme can be stated in five words: medicine's conceptual basis needs modernization.

The conceptual framework within which contemporary American physicians practice will soon be 100 years old. We might also commemorate the centennial of medicine as a biological science. About 100 years ago, sufficient knowledge had accumulated regarding the biology of disease to permit the visionaries of those times to consider medicine a bona fide intellectual discipline. They advocated that medicine should join its sister sciences within the universities; in a half-century this was entirely accomplished. A century ago, when confronted with the issue as to where within the university structure medicine should reside, educators decided to place medicine in that

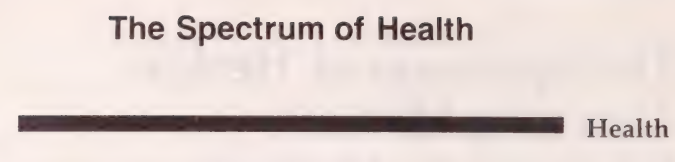


Figure 12.1.

sector of the university devoted to the works of nature, the natural and biological sciences. Medicine inevitably, then, became separated from the fields devoted to the works of humankind — namely the humanities and the social and behavioral sciences. It is not surprising that 100 years later the concepts that drive medicine derive largely from the natural sciences. The state of health is measured using biochemical and physiological parameters. Biological aberrations are thought to cause disease. Medical interventions are almost entirely biological intrusions. Concepts derived from the study of the works of humankind, the social sciences and humanities, have been largely excluded from the domain of the works of nature.

On this centennial of modern medicine, we should provoke consideration of the fundamental concepts of medicine that have driven education and practice. Three questions seem especially important for discussion: 1) What is health? 2) What are the determinants of health? 3) What are the points of intervention in health most appropriate for tomorrow's physicians?

We often assign our patients, and indeed those around us in our own circles and families, the attributes of health and ill health, as though they bore a dichotomous relationship to each other. Rather, as shown in figure 12.1, a continuous spectrum extends between perfect health and ill health. Currently available information on health status allows individuals, communities, or whole populations to be plotted at their respective positions along the spectrum. Some important indicators of health include life expectancy, infant and maternal mortality, morbidity and mortality rates from specific causes, body weight, serum lipid concentration, blood pressure, and disability figures. Further, a given position along the spectrum can change with time. Advances in sanitation and nutrition, economic circumstances and education, health care, or social norms and policies all represent attributes antecedent to one's position on this spectrum — and help determine it.

Certainly during the 100 years of medicine as a biological science, the collective efforts of science, clinicians, and the polity have made great strides toward improving the nation's health. The statistics for average life expectancy from birth speak clearly: forty-nine years in 1900; seventy-five years today. Yet, as Leonard Sagan points out in *The Health of Nations*, improvements in U.S. life expectancy in the past three centuries cannot be attributed to advancements in medical care, nutrition, or sanitation (1). Social factors, including level of education and economic circumstances, are the strongest correlates with life expectancy.

The great and shameful paradox in health in the United States is that the nation ranks first in the world in per capita health care expenditures (2), and first in the application of advanced technology, but tenth to twentieth in most statistics describing health status. In 1985, the country spent an estimated $425 billion on health care, almost $1,720 per person (3). Yet most industrialized nations, while spending considerably less, have lower infant mortality; and fourteen of these nations report greater life expectancy. In the United States, we join a few other Western industrialized countries in leading the world in the prevalence of major chronic diseases, including heart disease, cancer, and stroke.

- Each year some 1.5 million Americans suffer a heart attack; heart disease causes an estimated 770,000 deaths each year, or 38 percent of all deaths (4).
- An estimated 300,000 Americans die each year from causes directly attributable to cigarette smoking.
- The levels of illicit drug use by U.S. youths is greater than in any other industrialized nation in the world (5).
- We have 80 percent of the world's cases of AIDS in the United States.
- We have the highest rate of adolescent pregnancy, abortion, and childbearing among all Western developed countries (6). The more than one million adolescent pregnancies per year are often associated with negative health and social consequences, including premature birth, low birth-weight infants, physical and mental defects, and interruption of education for the new mother, leading to the perpetuation of poverty.

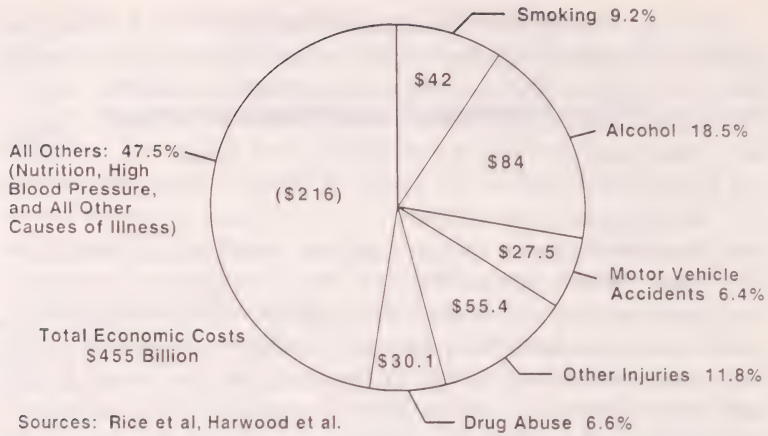


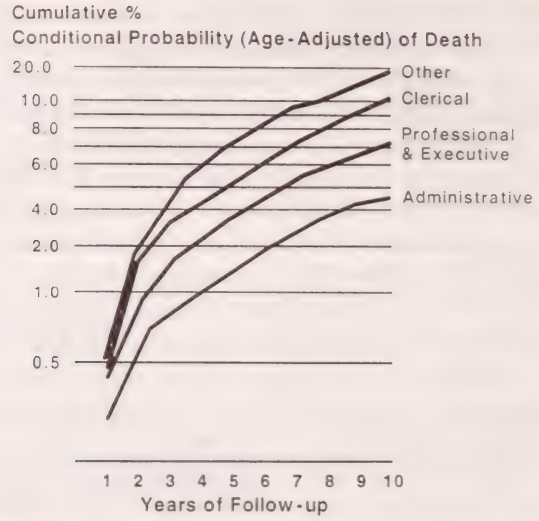
Figure 12.2. Contribution of Selected Risk Factors to Total Economic Costs of Illness (in Billions), 1980.

Surely the paradox of high health care expenditures and less than optimal health status cannot be fully attributed either to failures in health care delivery, as egregious as some of the defects are, or to failures of immunization and sanitation. Rather, dramatic shifts in disease patterns in the last 100 years suggest other factors. In 1900, the five leading causes of death in the United States were pneumonia and influenza, tuberculosis, acute intestinal infections, heart disease, and stroke, in that order. By 1985 the order became heart disease, cancer, stroke, accidents, and chronic lung disease, most of which are addressed by colleagues elsewhere in this volume. The shift from an earlier preponderance of infectious disease to the current prevalence of chronic disease, the rise in mortality from cardiovascular disease in the first half of the twentieth century and the decrease over the past twenty years, the increasing prevalence of some types of cancer and the decrease of others, and immigrants' single-generation adoption of the disease patterns of their new home countries—all these data suggest that influences external to the individual are major determinants of health and disease.

Using the total economic costs of all illness, as defined by Dorothy Rice and colleagues (7), we have analyzed the proportion of all illness attributable to antecedent factors. The antecedents are social rather than genetic or biologic. As figure 12.2

demonstrates, tobacco use, alcohol abuse, motor vehicle crashes and other injuries, and substance abuse together account for 52 percent of the total economic costs of illness. Dietary factors, lack of physical fitness, and unattended hypertension account for a high proportion of the remaining 48 percent. A recently completed project by the Centers for Disease Control and the Carter Center of Emory University indicates that two-thirds of all disease and premature death is due to behavioral and societal characteristics and is, therefore, theoretically avoidable (8). Negative health behaviors, rather than arising by chance, reflect the social circumstances immediately surrounding a person's life, including cultural beliefs; family customs; fads; fashions; social norms; commercial practices such as advertising and marketing strategies; the content of television, radio, and newspapers; political and economic features; local ordinances; and laws and regulations. The fundamental characteristics of a society determine the behaviors of its members, and these behaviors are the major determinants of health.

Socioeconomic status, including educational attainment, income, and occupation, has been demonstrated in the past ten years to be a powerful determinant of health. Figure 12.3 summarizes the important work of Michael Marmot (9). Marmot studied the age-adjusted mortality rates of 17,000 civil service employees in the United Kingdom followed for ten years and analyzed by job classification — manual, clerical, professional, and administrative. The study demonstrates an inverse relationship between job class and death rate: the lower the job class, the higher the death rate. Note that the vertical scale is logarithmic and hence may conceal the magnitude of the differences. The manual workers have death rates roughly two times greater than clericals, three times greater than professionals, and four times greater than administrators. The relationship is not limited to distinctions between the lowest and the highest job class (or income or educational levels). Rather, the results define a continuous inverse relationship over the entire spread of socioeconomic indicators, and even hold in a single job class when the members are subclassified according to educational level. Moreover, the same relationship between job class and mortality obtains when the data are analyzed for an individual disease entity, such as hypertension, diabetes, or cancer.



Source: Marmot et al.

Figure 12.3. Cumulative Conditional Probability of Death from All Causes (Age-Adjusted) in Ten Years, According to Civil Service Grade.

Similar relationships have been found in every society in which these factors were studied. For populations as a whole, persons with higher socioeconomic status for the most part exhibit better health status. This association between health and socioeconomic status not only distinguishes the poor from the nonpoor, but appears characteristic across the entire socioeconomic spectrum. A specific level of health cannot be explained fully by nutrition, clothing, housing, or access to medical care. Factors associated with education, occupational level, and income — factors not yet defined with specificity — might account for as much as half of the relationship between health and socioeconomic status. Education in particular seems to play an overriding role by conditioning tastes and preferences, affecting compliance with medical regimens, and influencing personal commitments to maintain health.

Low self-efficacy among the less well-off, a sense of inability to make a difference in the circumstances of one's life, may lower resistance to disease, as suggested by some recent authors. Much more research needs to be done. Nevertheless, the record strongly suggests my fundamental notion: lower socioeconomic status

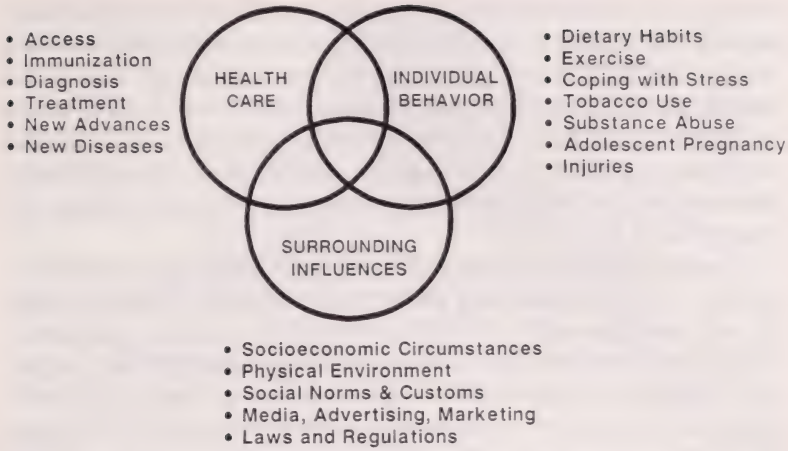


Figure 12.4. Determinants of Health.

does lead to poorer health and less favorable responses to therapy. Interventions focused on improving health must therefore take into account the concept that surrounding social circumstances in themselves lead to disease and death quite independently of, or in interaction with, the effects of genes, unhealthy behaviors, and the availability of health care.

Figure 12.4 summarizes the relative roles of health care, individual behavior, and societal influences in determining health. Such determinants are the precursors of the biological processes by which disease becomes manifest. Again, using the total economic costs of illness to estimate the relative contributions of health care, individual behavior, and surrounding influences to determining the station along the spectrum of health for the United States, it is clear that the determinants overlap and interact. Certainly some aspects of individual behavior result directly from powerful surrounding influences. For example, diet, tobacco use, drug abuse, and adolescent sexual activity are influenced by social norms including television programming and advertising.

These social norms, tobacco smoking for example, ultimately become sustaining forces by becoming encoded in laws and regulations, such as subsidization of tobacco farming and low excise taxation of tobacco products. Similarly, the surrounding influences powerfully affect the effectiveness of and accessibility to

health care, as exemplified by the fact that 35 million Americans are without health insurance, and health care has a weaker effect on the health of lower socioeconomic groups than on that of the middle class. Considering all of these factors and making gross estimations, each of these three broad categories of determinants accounts for something like one-third of the influences determining an individual's or a population's station along the spectrum of health.

Clearly, advances in medical care, both diagnostic and therapeutic, have been nothing short of astonishing. In the decades ahead, medicine will continue to introduce amazing treatments that promise to ease the suffering of large numbers of people. As a primary determinant of health, medical care as it stands plays only a modest subsidiary and after-the-fact role. Perhaps the U.S. paradox in health — larger expenditures for health but less favorable health status compared to many other nations — can be explained in part by the large amount of resources devoted to medical care, and the neglect of the more fundamental underlying characteristics of United States society and individual behavior. Some of those underlying social characteristics are powerful negative indicators, and indeed adverse determinants, of good health.

We may view ill health as an outcome poised at the apex of a pyramid of antecedent underlying factors, as indicated in figure 12.5. Cardiovascular disease may serve as a useful example, accounting as it does for about a million deaths per year, not to mention half of the total economic costs of illness. Employing the conceptual framework that has grown out of biology and the other natural sciences, physicians have focused on genetic causes, or new techniques to crush atherosclerotic plaques, or transplantation. Genetic factors clearly play a role, but genetic factors related to congenital hypercholesterolemia account for only a minor portion of cardiovascular disease. Multiple genetic factors acting in concert may predispose a person to develop cardiovascular disease, but only external factors can trigger this predilection and can suppress it as well.

The physiological risk factors that precede and lead to cardiovascular disease include hypercholesterolemia and several others, which in fact stem directly from antecedent behavioral risk factors, such as a diet in which 40 percent of the calories are derived from fat. Behavioral risks are not randomly selected by

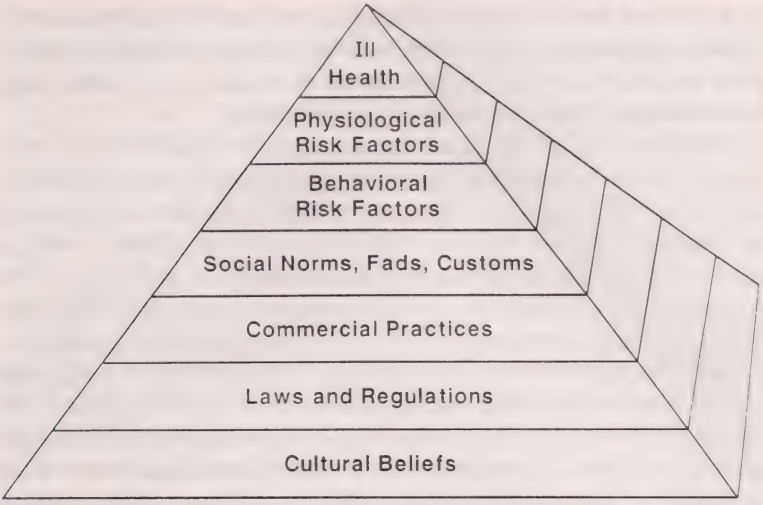


Figure 12.5. Points of Intervention in Health.

individuals or populations but reflect social norms, fads, and customs such as the United States preference for animal fats and dairy foods. The social norms are reinforced by commercial practices such as the production, distribution, advertising, and marketing of beef and dairy products that are high in fat and cholesterol.

These commercial practices frequently become universal and enduring by becoming fixed in laws and regulations. For example, agricultural subsidies provide powerful incentives for the production, distribution, and marketing of high-fat milk and its products; these same subsidies penalize economically the production and marketing of low-fat milk products. Similarly, the Department of Agriculture's regulations on labeling of meats and processed foods encourage and sustain high-fat diets.

Underlying and supporting the pyramid of causation are cultural values and beliefs. Americans place a high value on a free economy with minimal regulation, and especially on individual freedom and free choice. The freedom to promote, offer for sale, and purchase deadly products such as animal fat, cigarettes, and firearms is fastidiously protected by the same populace that celebrated these freedoms in its bicentennial year. Individuals, businesses, governments, and professional societies lack the will

to think and behave with the long-term health of individuals as a principal concern, and Americans have an unrealistic dependency on health care and especially on the newer high-technology interventions to assure individual well-being.

Diabetes and pulmonary disease would illustrate my point equally well. To take the latter example, lung disease, and moving from the base to the disease at the apex, free unregulated enterprise supports the next level, farming of tobacco and an astonishingly low excise tax on tobacco products. Moving up the pyramid, this access permits the marketing and advertising of cigarettes to youths, minorities, and other groups, further promoted through carefully cultivated associations between the image of tobacco use and the worlds of the chic, the glamorous, and the athletic. Next, as smoking becomes accepted behavior among youths and in homes and public places, 28 percent of the adult population smokes chronically; chronic bronchiolar inflammation ensues, followed by airways obstruction, decreased physical functioning, diminished social and role performance, dwindling quality of life, hypoxemia, carbon dioxide retention, and death from emphysema.

By far the overwhelming concern of the physician has been at the top of this pyramid, the diagnosis and treatment of ill health. The physician attends to the physiological risk factors, which are the direct physical and chemical antecedents and accompaniments of ill health, but almost every study of the matter indicates that physicians pay scant and ineffective attention to behavioral risk factors and their roots in antecedent circumstances. Most practicing physicians leave these topics for study by public health specialists because medical education and practice remain restricted by an almost exclusively biological perspective.

Physicians' predominant focus on diagnosis and treatment through the narrow-angle lens of the biological concept of health may have been appropriate for the century of medicine as a biological science. It seems unlikely there will come a time when patients will cease to need medical men and women to inhabit their traditional roles as technical experts; in that, physicians are irreplaceable. But advancements in science, in both the natural and the social sciences, permit the medical profession, in concert with other elements in society, to plumb deeper into the heart of the pyramid. Interventions developed out of such an effort are more likely to be cost-effective in the end, before disease and

premature death become inevitable. At another time and in another era, concentration at the top may have been appropriate. Now, with the paradox of health and with new understanding of the determinants of health, the vista of physicians' concern should be broadened. The place to start is in medical education.

Medicine as a biological construct deserves a centennial celebration. By itself, however, biology as a basis for medical practice is insufficient. We need to understand health in sociocultural and behavioral, as well as biological, terms, and to join biological concepts with those stemming from social, economic, governmental, and cultural phenomena. New roles for physicians and new interventions of greater potential benefit to patients await our enthusiastic embrace. The roles of physicians as providers caring for patients, and as professional figures with inherent authority in an increasingly fragmented and leaderless society — these roles need to be cast in a new configuration. Until this is accomplished, attempts to improve medical education will be of limited benefit.

The paradox of health in the United States gives urgency to this new understanding of the determinants of health and disease. Perhaps it would be useful to pause a while from the exercises concerning inpatient versus outpatient assignments, and the hope that the microchip will manage the knowledge explosion, to define with a fresh view the social purposes of the medical profession and the role of the physician within a more modern paradigm of health.

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Chapter 13

The Epidemiologist's Perspective: Looking toward the Twenty-first Century

PAUL D. STOLLEY

One of the necessary and useful functions of epidemiology is tracing the rise and fall of diseases over time in populations. This long view helps maintain a realistic perspective in civilization's battle to subdue disease—a perspective it may be hard to find as medical practitioners deal with sick patients on a day-to-day basis. In addition to this historical approach, epidemiology can provide an international perspective so that local or national disease problems are not emphasized to the exclusion of health problems that may beset the majority of humankind. On other continents and in Third World countries, morbidity and mortality patterns may be strikingly different from those we experience in the developed Western world.

The contributions of epidemiology to the understanding of the worldwide causes of ill health and to ways of preventing disease are considerable. These will be highlighted as they apply to disease patterns in the developed world.

The "Last Two Minutes" of Geological Time

When faced with a minor but irritating personal problem, psychologists remind us that it is sometimes helpful to put the annoyance in perspective and think how one would regard the personal calamity in the context of cosmic time. Such advice rarely helps, but the exercise of examining current patterns of

health and disease over the entire span of human history may be a more useful exercise. I shall attempt briefly to summarize major factors affecting population growth and mortality from disease.

Our knowledge of the epidemiological patterns of disease before written history can only be surmised from rare archaeological evidence, but paleopathologists have made educated guesses about the health conditions of our earliest ancestors. These hunter-gatherers have left few signs of their mode of existence, but the paleolithic diet has been reconstructed by knowledge of plants and animals available to them for food. The overwhelming causes of death for paleolithic man were probably infectious diseases and trauma. The short life expectancy and high infant mortality rate resulted in slow population growth, which was further limited by the meager and uncertain food supply. When people became cultivators and established a more secure food supply, the causes of death in all probability remained the same but population growth increased.

With the development of animal husbandry, a new group of diseases emerged as man lived closer to other animals and fell victim to their parasites: tuberculosis, brucellosis, salmonellosis, and perhaps even malaria resulted from the contiguity of man and domesticated animals. Drought and plant pests caused periodic famine so that population growth was checked in irregular cycles. The revolution in agriculture that came about as a result of the development of tools such as the plow and the invention of the harness produced enough grain to reduce the threat of famine. Increasing population in the cities led to diseases of overcrowding such as the great plague and cholera epidemics. But by the Renaissance and later, the construction of public water supplies and sewage disposal led to a reduction in the incidence of certain water-borne diseases, such as typhoid and cholera; and a minor increase in life expectancy probably began at that time.

In Third World countries today, many of the enormous health problems are still similar to those found in the United States at the time of the founding of the College of Physicians two hundred years ago, compounded by urban and rural poverty and unprecedented population growth. Americans, on the other hand, face new health threats that are unique to the developed world.

The Health of Americans in the Twentieth Century

Today, heart disease, cancer, and stroke are the leading causes of death in the United States; and the first two are strongly linked to cigarette smoking as is another leading cause—chronic obstructive pulmonary disease. In fact, we are presently in the sixtieth or so year of an epidemic of smoking-induced disease that began shortly after World War I. Increased cigarette smoking and its related addiction were a direct result both of that war and technological advances in tobacco curing that permitted the mass merchandising of the cigarette pack.

Several million American men were habituated to cigarettes while serving in the armed forces during World War I. This resulted from a policy of pacifying troops that had to endure dreadful conditions in the trenches amid the boredom and horror of war. The inhaling of cigarettes became possible with advances in curing tobacco that made it less harsh, and this, along with a transportation and communication system that allowed marketing throughout the country, resulted in a rapidly developing national addiction.

World War II was longer than the previous war and more people were mobilized. Service in World War II also often led to cigarette addiction. The cost of cigarettes was reduced or subsidized for servicemen, and free cigarettes were sent to soldiers by the manufacturers; indeed, sending cigarettes to "our boys over there" was promoted as an act of patriotism. Following World War II, cigarettes were developed specifically for women (menthol flavored and the like), and the proportion of women who smoked increased.

The result of this national epidemic of cigarette addiction has been a greater loss of life than that due to death from all the wars fought in our entire history. Cigarette-induced disease takes the lives of 350,000 Americans each year; 30 percent of all cancer is caused by cigarettes. Heavy smokers are three-to-four times more likely to die of cancer than are nonsmokers and are 15-to-25 times more likely to die of lung cancer. Lung cancer is now the leading killing cancer of women as well as of men—and the epidemic curve is still rising for American women. Cigarettes are also important in causing oral, laryngeal, esophageal, bladder, kidney, and pancreatic malignancies.

Cigarette smoking is also one of the three major risk factors for the development of coronary heart disease, which is the leading cause of death in the United States; and for chronic obstructive pulmonary disease, one of the ten leading causes of death, which is found almost exclusively in cigarette smokers.

The second habit that is disastrous to the health of Americans is our addiction to alcohol. Not only cirrhosis mortality (one of the 15 leading causes of death), but also automobile accidents, drownings, and homicide — all strongly related to excessive alcohol intake — take a toll of life.

Increasingly, addiction to illicit drugs, such as cocaine and heroin, is beginning to affect the health of Americans through direct properties of the drugs and also through diseases such as AIDS which are transmitted by contaminated blood from shared needles.

Homicide has become the leading cause of death among black American males aged 15-to-39 years. A black child born today has a cumulative lifetime chance of almost one in twenty of becoming a homicide victim. Most of these murders are committed by friends, family members, or acquaintances of the victim. The killing weapon most often used is a handgun.

The newest threat to the health of the nation (and the world) is the global pandemic of Acquired Immune Deficiency Syndrome (AIDS), an apparently new disease caused by a retrovirus. Transmitted by sexual contact or contact with infected blood, the infection has an extraordinarily high case-fatality rate. While it is not possible to predict its future course reliably, AIDS is certain to become a major killing disease if a vaccine is not developed soon. While currently the epidemic is concentrated among homosexuals and drug addicts who use contaminated intravenous equipment, it is likely that the disease will soon spread to heterosexual nonaddicts. Unfortunately, a vaccine is not likely to be developed soon.

Threats to the health of Americans looming on the horizon include contamination of water supplies by radioactive wastes from bomb and energy production, contamination from toxic dump sites that leak into the water table, and the ultimate threat of extinction due to nuclear war.

By the summer of 1988, speculation about global climatic change had become a constant preoccupation of magazine and newspaper columns because of the drought in the United States. The

"hole" in the stratosphere over the Antarctic resulting from depletion of the thin ozone layer is now generally accepted by scientists and is mainly due to the release of fluorocarbon gases and the burning of fossil fuels. This loss of ozone is expected to permit greater penetration of ultraviolet radiation and hence an increase in skin cancers as well as plant mutations and damage. Speculation is rife as to whether or not the warming trend from the greenhouse effect is in evidence. This warming trend is attributed to carbon dioxide accumulation from the burning of fossil fuels and may lead to widespread disturbances in food production and other natural disasters.

The problem of acid rain, which can destroy forests and contaminate lakes to such an extent that fish can no longer survive, has been documented. A New York State commission has just concluded that 25 percent of the Adirondack lakes can no longer support game fish species because of acid rain contamination. Canada and the United States are meeting to attempt to limit this damage, belatedly acknowledged by the Reagan administration (at first it was trivialized by the president).

The building of the Aswan Dam provides another example of how disturbances in ecology can affect human health. The dam, built to provide badly needed cheap energy in Egypt, also allowed the snail that serves as intermediate host of the disease schistosomiasis to extend its range so that the disease spread to previously unaffected populations.

As our ability to alter the environment increases, so does our understanding of ecological relationships. It is now clear that a local or even national approach to resource management and health will not prove sufficient: freon propellant used for deodorant in cannisters manufactured and used in the United States may destroy the ozone layer over the Antarctic and cause skin cancer in Chile; the burning of oil in Pennsylvania may lead to destruction of the aquatic environment of a beautiful Ontario lake; and dam construction in one part of Egypt may cause an epidemic of schistosomiasis in another part of that country. Perhaps the worst scenario is an exchange of nuclear weapons between the United States and the USSR, causing a nuclear winter and destroying the agricultural capability of the globe. This latter scenario is no paranoid nightmare but a distinct possibility.

Disease Prevention in the United States

The greatest single action Americans can take to improve the nation's health would be to stop smoking cigarettes. This would lead to a 30 percent to 40 percent reduction in cancer mortality and perhaps a 30 percent reduction in death and morbidity from coronary heart disease. The main emphasis on the role of cigarettes and disease has been to try to get individuals to modify their behavior and either not start to smoke or stop smoking. This effort has had only moderate success, and for some groups, such as teenage girls, no progress is evident.

A realistic plan to curb cigarette consumption in the United States will probably require the following elements:

1. A plan to convert southern agriculture to the growing of socially useful and beneficial crops such as food;
2. A recognition that cigarette advertising is a profoundly immoral act and the virtual elimination of cigarette advertising (Canada has just accomplished a national cigarette advertising ban);
3. Readily available help for smokers who wish to quit in the form of low-cost community "Quit Programs," accompanied by continued support for the quitting smoker;
4. Economic disincentives to smoke: a higher cigarette tax, raised life insurance premiums for smokers, and similar methods;
5. Increased public pressure on smokers in the form of smoking bans in the workplace, public buildings, restaurants, and airplanes;
6. Massive public campaigns alerting the populace to the manifold health risks of smoking;
7. More active participation by practicing physicians and other health professionals in the antismoking campaign.

Such a systematic and organized national campaign would easily justify its costs by the savings gained with the ensuing reduction in morbidity, disability, and mortality.

A reduction in the burden of coronary heart disease may be harder to accomplish. This is partly because coronary heart disease rates have already dropped markedly in the past 15-to-20 years, probably because of dietary change, better medical care

of the acute victim, treatment of high blood pressure, and perhaps other unknown factors. While there may be a place for chemoprophylaxis (the use of aspirin), the continued change in diet and cigarette smoking habits promises a continued beneficial effect. A national program for hypertension screening and treatment over the past two decades has proved successful as measured by disease detected and treated and by a drop in death rates for stroke. A national program for cholesterol screening has just been launched, but cholesterol reduction will probably prove harder to implement.

Other killing diseases that are amenable to screening, early detection, and treatment include cervical cancer and breast cancer. The cervical Pap smear and the mammogram have been shown to reduce mortality from cervical and breast cancer. Unfortunately, it is still not known whether or not screening for colon cancer is feasible. Prostate, ovarian, and pancreatic cancer are difficult to detect at an early stage and hard to cure once detected.

Reduction of the homicide death rate (which actually has fallen slightly over the past ten years or so) will be more intractable to the extent that it can be attributed to social and economic conditions, such as poverty, and the dissolution of families. However, strict handgun legislation is likely to have a powerful and immediate effect. An estimated 60 million handguns are in circulation in the United States, and the easy availability of this concealable weapon has turned family and other arguments into fatal encounters. Attempts to teach "conflict resolution skills" while handguns are in the bedside table drawers of one out of four American adults are unlikely to succeed. Some national awareness of the enormity of the problem with resultant concern and indignation is probably required before we will see a change in the laws governing gun ownership. Such a mobilization of opinion has occurred in the past regarding the use of illicit drugs, alcohol, and, now, cigarettes—but a powerful lobby opposes handgun control, just as a different lobby supports cigarette use.

Death resulting from trauma from automobile accidents is strongly related to alcohol use: a number of studies show approximately 50 percent of such trauma is connected with excessive alcohol consumption. European experience suggests that significant reductions in injury and death rates from automobile

accidents can be achieved with legislation requiring seat belt use and severe punishment of drunken drivers. Mandatory provision of air bags is expected to result in a further decrease of head injuries from collisions and thus reduce death and disability rates.

The U.S. automobile manufacturers have changed their stance from one of adamant opposition to seat belt and air bag requirements to one of assuming credit for these safety advances — which they fought up to the last minute.

Looking toward the Twenty-first Century

The United States Public Health Service and the United Nation's World Health Organization have developed targets for improved health for the developed world. They are similar, with the exception that homicide is not an important cause of death in the developed world outside the United States. Listed below are the health targets for the European strategy of the World Health Organization.

Health for all:

1. Equity in health.
2. Adding life to years.
3. Better opportunities for the disabled.
4. Reducing disease and disability.
5. Eliminating measles, polio, neonatal tetanus, congenital rubella, diphtheria, congenital syphilis, and indigenous malaria.
6. Increased life expectation at birth.
7. Reduced infant mortality.
8. Reduced maternal mortality.
9. Combating diseases of the circulation.
10. Combating cancer.
11. Reducing accidents.
12. Stopping the increase in suicide.

Lifestyles conducive to health for all:

13. Developing healthy public policies.
14. Developing social support systems.
15. Improving knowledge and motivation for healthy behavior.

16. Promoting positive health behavior.
17. Decreasing health-damaging behavior.

Producing healthy environments:

18. Policies for healthy environments.
19. Monitoring, assessments, and control of environmental risks.
20. Controlling water pollution.
21. Protecting against air pollution.
22. Improving food safety.
23. Protecting against hazardous wastes.
24. Improving housing conditions.
25. Protecting against work-related health risks.

Providing appropriate care:

26. A health care system based on primary health care.
27. Distribution of resources according to need.
28. Reorienting primary health care.
29. Developing teamwork.
30. Coordinating services.
31. Ensuring quality of services.

Support for health development:

32. Developing a research base for health for all.
33. Implementing policies for health for all.
34. Management and delivery of resources.
35. Implementing health information systems.
36. Training and deploying of staff.
37. Educating people in the nonhealth sector.
38. Assessment of health technologies.

The AIDS epidemic has altered all the health plans developed before a mere ten years ago. This pandemic will consume much of the world's health budget over the next few decades, barring a quick development of a vaccine. The epidemic is rapidly altering the health picture of central Africa where entire villages face decimation; major cities in Africa, such as Nairobi and Kampala, are also threatened by the spread of AIDS. In the United States, the immediate task is to try and prevent the spread of the disease to the heterosexual community; the battle to protect homosexuals and intravenous drug-using addicts from AIDS is probably already lost.

The promise of high technology applied to the medical field will not have a large effect on the three major killers over the next decades. Heart transplantation, bypass grafts, and angioplasty have some use in the end stage of coronary heart disease, for example, but the burden of this disease is so great (one in five U.S. men have some important manifestation of this illness by age 60) that prevention is the only realistic strategy.

Similarly, while the application of the advances in molecular biology are just beginning, and cannot at present be reliably predicted as applied to the problem of cancer, prevention has greater promise of containing this disease than does the application of technology. For both coronary heart disease and cancer, the cessation of cigarette smoking is of the utmost importance; the benefits of such programs can be predicted and are certain. Dietary changes leading to a reduction of saturated fat, cholesterol, and caloric intake will also lessen the incidence of coronary heart disease. These are specific measures that will reliably prevent diseases that have been epidemic in the United States for 60 or more years; other measures must be taken to prevent the emergence of new diseases. AIDS prevention will require a change in sexual behavior. Hard thinking about the environmental effects of nuclear and solid waste disposal are required to develop a plan and initiate action both to preserve our environment and to prevent the emergence of new health threats.

Understanding the necessary health strategies for the next century will require not just a knowledge of medicine but familiarity with history, ecology, and economics. A new synthesis is needed with a clear understanding that a global perspective must replace national and parochial views of health.

The World Health Organization can play a crucial role in formulating strategy, as the worldwide eradication of smallpox has demonstrated. The old cliché that we are "one world" has at last become a truism.

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HARRY M. MARKS, Ph.D. is a Research Fellow at the Johns Hopkins University Institute for the History of Medicine, where he is working on a book concerning therapeutic experimentation in twentieth-century America.

JOHN M. O'DONNELL, Ph.D. is Executive Director of the College of Physicians of Philadelphia and author of *The Origins of Behaviorism: American Psychology, 1870–1920* (New York: New York University Press, 1985).

SAMUEL X RADBILL, M.D. (1901–1987) identified himself for this article as "formerly Honorary Librarian of the College of Physicians of Philadelphia." A personal appreciation of his life by Fred B. Rogers appears below.

FRED B. ROGERS, M.D. is Professor of Family Practice & Community Health at the Temple University School of Medicine. He is a past editor of the *Transactions & Studies of the College of Physicians of Philadelphia.*

BARBARA H. TRAISTER, Ph.D. is Professor of English at Lehigh University. She is the author of *Heavenly Necromancers: The Magician in Renaissance Drama,* (Columbia, Missouri: University of Missouri Press, 1984), and is currently working on a biography of the late sixteenth-century English astrologer/physician Simon Forman.

GRETCHEN WORDEN, B.A. is Director of the Mütter Museum, and Custodian of the Collections of the College of Physicians.

Editorial

With this issue, *Transactions & Studies* returns as a quarterly publication of the College of Physicians of Philadelphia. Reflecting the activities of the College, *T&S* will continue to provide Fellows with reports of the lectures, symposia, conferences and other programs of the divisions, sections and fellowship of the College. There will also be occasional obituary notices and reviews of books relevant to the concerns of this medical academy.

The focus in Series Five of the College journal remains "Medicine and History" which, in this issue, spans the period from Captain Munk's tragic voyage of exploration in 1619 to the Sesquicentennial of the Vienna Royal Society of Medicine in 1987. The Francis C. Wood Institute, which now edits the journal, is concerned with contemporary issues in historical perspective, the view of Winston Churchill that "the longer you can look back, the further you can look forward."[1]

The ophthalmologists Daniel Albert and Harold Scheie opened their *History of Ophthalmology at the University of Pennsylvania* with this quote from Churchill, and ophthalmology is the medical specialty with the longest "look back," and with a rich tradition of historical writing. In this issue we feature ophthalmology as it appeared at the meeting of the Section on Medical History of the College in September 1988, where Daniel Albert and the Mütter Museum's director, Gretchen Worden, were the speakers. A major ophthalmology exhibit was opened in the museum, accompanied by a display, in the main hall, of the library's great collection in ophthalmology prepared by Thomas Horrocks, Associate Librarian for the Historical Collections. Papers by Albert, Horrocks, and Worden comprise the special section of this issue along with a list of current Fellows of the College whose primary medical identity is as ophthalmologists.

The College's relationship with ophthalmology is longstanding. There are college rooms with portraits, named for William Thomson, and for William Fisher Norris. President George E. de

1. D.M. Albert and H.G. Scheie, *A History of Ophthalmology at the University of Pennsylvania* (Springfield, IL: Charles C. Thomas, 1965), p. ix.

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Schweinitz was the first ophthalmologist President of the College, as he was of the American Medical Association. Other ophthalmologists have their portraits here: Isaac Hays, George Cuvier Harlan, William Zentmayer. The articles by Associate Librarian Thomas Horrocks and Museum Director Gretchen Worden introduce us to the collections that these and other Fellows and friends have generously provided the College over the last 200 years.

Ophthalmology paved the way for the specialty sections of the College. An institution dedicated to the public commons of medicine, the College resisted subdivision into specialty groups. In 1890, however, Edward Jackson proposed that the College introduce a regular discussion section for the scientific interests of fifteen of the Fellows of the College. By 1892, when Council acceded to the request, sixty-three of the 234 Fellows wanted to have sections on ophthalmology, orthopedics, and gynecology.[2] At a time when regular medicine was professionalizing, the College kept a close eye on specialism as synonymous, in some circles, with quackery. Others, like William Osler, recognized that specialism was a necessity, even though they also believed that all medicine is general medicine and that specialists encroach on the territory of general practitioners.[3]

In 1943, when professional medicine was secure and the relationship between generalist and specialist had taken its modern form, the College celebrated the golden jubilee of ophthalmology. They saw what George Rosen described a year later as the process of specialization, a dynamic interplay of new definitions of disease with new technologies.[4]

Since the 1940s we have come to take this process for granted, and to worry about its limits and consequences. Ophthalmology continues to generate remarkable developments in surgical instrumentation and techniques, and in new concepts of disease and abnormality. But the subdivision of the specialty, with an explosion of activity in neuro-ophthalmology and other areas, raises questions

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2. Whitfield J. Bell, Jr., *The College of Physicians of Philadelphia: a Bicentennial History* (New York: Science History, 1987), p. 188ff.

3. Stewart Wolf, "Commentary on William Osler's Remarks on Specialism," in *William Osler: The Continuing Education,* John P. McGovern and Charles G. Roland, eds. (Springfield, IL: Charles C. Thomas, 1969), pp. 53–59.

4. George Rosen, *Specialization in Medicine with Particular Reference to Ophthalmology* (New York: Frober Press, 1944), p. 22; cf. George Rosen, "Stabilization of the Medical Market 1910–1940" in *The Structure of American Medical Practice, 1875–1941,* Charles E. Rosenberg, ed. (Philadelphia: University of Pennsylvania Press, 1983), Chapter 2.

about the center of authority in the research field. The commercial success of some branches of the field is also problematic, posing moral dilemmas for ambitious physicians that the *New England Journal of Medicine* playfully described in "Ophthalmology Superstar: A Modern Parable."[5] The history of ophthalmology comforts us with the message that these problems are not new.

5. "Editorial," *New England Journal of Medicine,* October 27, 1988.

Ex Libris Bibliothecae Collegiensis Medicorum Philadelphiensis: The Growth of a Library as Seen From Its Bookplates

SAMUEL X RADBILL

The Library of the College of Physicians of Philadelphia originated in 1788 with a gift of twenty-four books by Dr. John Morgan. These kindled an enlightening flame that successive generations of dedicated doctors have sustained for two centuries.

Dr. Morgan sported a fine chippendale armorial bookplate (see Fig. 1) engraved by Henry Dawkins, an early Philadelphia artist when Pennsylvania was still a loyal British colony. It bears the appropriate motto: *Fama praestante praestantior virtus* ("when fame is outstanding, virtue stands out the more"). Until he became involved in the political intrigue of the American Revolution, Dr. Morgan's fame and virtue as a medical educator were widely known.

When the College of Physicians of Philadelphia came into being in 1787, the Revolutionary War had been won and the new nation, welded into a union that year, was busily laying the foundations for political, economic, social, and scientific progress. That year the American Philosophical Society erected a home of its own in the State House Yard alongside Independence Hall, and some of the leading medical members banded together to form a separate medical "Collegium." Fashioned after the Royal College of Physicians of London and other European societies, this Collegium was designed to be for medicine what the American Philosophical Society was for general science. Among its aspirations was the expansion and dissemination of medical knowledge. At the second meeting of the College on 6 February 1787, Dr. Benjamin Rush stressed the role of a library as a means of promoting medical science. A library committee was formed and a plan formulated for collecting books donated by members, for procuring a suitable repository for them, and also for buying books.

The College library grew slowly by gift and by purchase. In 1792 Dr. Nicholas B. Waters, and a little later Michael Leib, volunteered to act as librarians. Until 1834 the Library was in the charge of the censors. Then the standing committee on the library

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Figure 1. First Bookplate of the College of Physicians, 1789. From a book donated by Dr. John Morgan, 1788.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

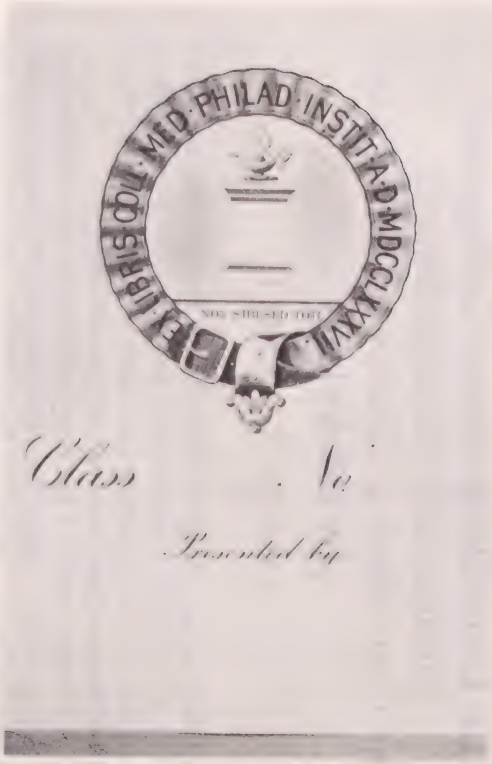

Figure 2. Current Bookplate of the College of Physicians.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

was created, the chairman of which was regarded as the librarian. In 1854 the office of librarian was established with the first librarian, T. Hewson Bache, elected 3 January 1855. In July 1881 Charles Perry Fisher was engaged temporarily as assistant librarian and later as librarian in fact, when the office of librarian previously assigned to a Fellow of the College was changed to that of Honorary Librarian.

In 1844 after the library of Dr. John Conrad Otto was acquired, a Fellow was appointed as librarian to be present for one hour twice a month to lend out books. A year later the time was increased to three hours. In 1859 the library was open one evening every week. Finally, in 1886, Dr. George B. Wood from his own pocket provided an annual contribution to enable the library to be open every day with a librarian present.

Once the books were available for use by the Fellows, a suitable protective bookplate was needed. At first a simple, oblong label to identify the College ownership proved adequate. Within an ornamental border was the unmistakable pronunciamento: "Belonging to the Library of the College of Physicians of Philadelphia." At the bottom was the College motto. Under this a line allows for the acquisition number. This book label probably dates from 1789 (see Fig. 2).

The College motto, adopted at the foundation of the institution, is a classical phrase from Lucan's *Pharsalia* (Book II; V, 383): *Non sibi sed toti* ("not for ourselves but for all mankind"). It was a favorite apothegm of the famous eighteenth-century London medical bibliophile, Richard Mead, who was not only a very rich physician but an eminent Greek and Latin scholar, the Maecenas of his day. Mead amassed a personal library of such magnitude that after his death it took 28 days to auction off his books. The same motto also forms part of the heraldic bookplate of William Wynne, a judge in the courts of London and a member of the board of trade in the late nineteenth century.

The next label (see Fig. 3) had a tastefully decorated border with conventional scrolls and a line to serve for the shelf number. It was used after the supply of the first one was exhausted. It seems these ownership reminders failed of their purpose because soon some of the books were reported as missing and a catalogue had to be compiled in 1819 to keep track of the College possessions.

In 1825 the library of the Kappa Lambda Society was deposited in the College of Physicians and in 1844 the library of Dr. John Otto was acquired by purchase. These greatly augmented the

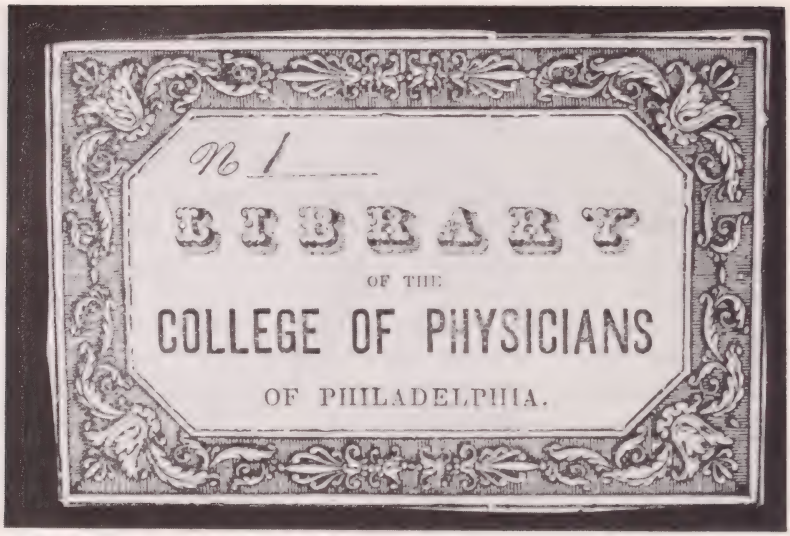

Figure 3. Second Bookplate of the College of Physicians.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

Library, and a new catalogue was prepared. A third catalogue was prepared in 1855. This was superceded by a card catalogue in 1881, which computers are now making obsolete.

By 1846 the Philadelphia Medical Society was running out of steam and deposited its library in the College, but it reclaimed it again in 1859. When this society finally disbanded in 1868, after vainly opposing the Philadelphia County Medical Society, it created a fund whose interest was designated for library use by the College. A suitable bookplate commemorates this gift.

In 1856 a gift of 900 volumes by Dr. Thomas Forrest Betton increased the number of books to about 4000. Married to a descendent of James Logan, a name prominent in the library annals of Philadelphia, it was only natural that Dr. Betton would acquire a large and important library of his own. When he began to disperse his collection he made extensive gifts of medical books to the College of Physicians of Philadelphia, many of them rare and useful. At least half a dozen different bookplates he used in his treasured volumes are still to be found in books of the College library. In addition, the College printed a memorial label inscribed: *Ex Libris Bibliothecae Bettonianae. Collegiensis Medicorum Philadelphiensis. MDCCCLVII.* Dr. Betton's personal bookplates usually dis-

played an armorial shield with a crowned lion rampant on the crest and the motto: *Nunquam non paratus* ("never unprepared") (see Fig. 4).

An important event in the early history of the library was the gift in 1864 of 2500 volumes by Dr. Samuel Lewis. These books had been carefully selected by Dr. Lewis who was an accomplished scholar and an ardent lover of books. During the next 25 years he devoted the greater portion of his time to the Library of the College of Physicians and by 1890 the Lewis Collection alone contained more than 11,000 volumes. Some of the choicest treasures of the library are to be found in the Lewis Library.

Dr. Lewis's personal ex libris displays a moth mounted on top of a cranium with his autograph below. On a heraldic ribbon below the skull is his Cartesian motto, "*que sais je?*," as if to question what we know when we deal with life and death in the practice of medicine (see Fig. 5). The skull is a favorite symbol of medicine even though it symbolizes death. The moth or butterfly was called "Psyche" by the Greeks, to whom it symbolized the animated vital spirit, the soul which endows us with life. It was in this way that Dr. Lewis provided on his bookplate the esoteric clue to his profession.

The same pictorial design was continued by the College when it printed its own bookplates for the books added to the Lewis collection. Simple engraved labels were also printed that just state: College of Physicians of Philadelphia–Lewis Library. There is also space on each bookplate to designate "Class" and "No." of each book. Some include in addition the names of other donors.

In 1880 Dr. S. Weir Mitchell established a Journal Fund but did not restrict its use too rigidly. He doubled this fund two years later. In 1961 Dr. George I. Blumstein inaugurated the S. Weir Mitchell Associates, accumulating an additional substantial journal fund. Appropriate bookplates have been supplied for these as well (see Fig. 6).

The other large private libraries joined the College collections in 1885. One was the library of Dr. Hugh Lenox Hodge. Samuel David Gross, immortalized by Thomas Eakins in the stark painting which shows the great surgeon in the Jefferson Medical College surgical amphitheater, was elected a Fellow of the College of Physicians of Philadelphia in 1857 while he still resided in Louisville, Kentucky. Among his many accomplishments, he was a maker of medical societies and in 1879 founded the Philadelphia Academy of Surgery. A printed plate for the Samuel D. Gross Library of the

Figure 4. Bookplate of Dr. Thomas Forrest Betton, ca. 1857.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

Figure 5. Bookplate of Dr. Samuel Lewis, ca. 1864.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

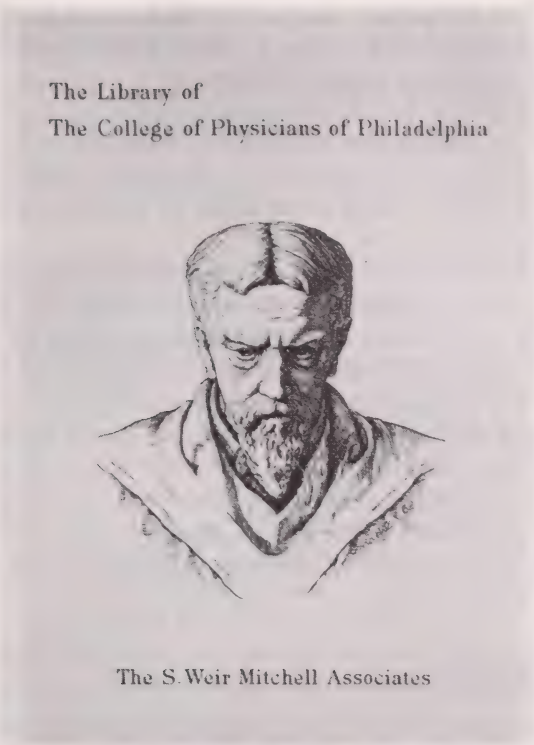

Figure 6. Current Bookplate of the S. Weir Mitchell Associates.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

Philadelphia Academy of Surgery marks the books in this specific collection. When the Academy of Surgery deposited its library in the College, it stipulated that the books should become the property of the College upon dissolution of the Academy.

Another eager supporter of the library was Dr. W. W. Keen. When he was president of the College about 7000 theses and inaugural dissertations were acquired from various foreign universities. In 1908 he and Dr. Osler effected a goodly number of exchanges with the Faculty of Medicine of Paris. Unfortunately the names of these two benefactors of the library do not appear on any of the College bookplates.

Keen and Osler were especially fond of medical incunabula. On one of his European jaunts, Dr. Keen snared about 14 precious fifteenth-century medical classics and brought them back to the

College in one fell swoop; and in 1907 he brought back 23 more. Only a small card with his name modestly printed on it marks the books from Dr. Keen's personal library.

In 1893 S. Weir Mitchell presented the College with 42 incunabula, and the remarkable collection of J. Stockton Hough, purchased in 1901, enriched the library's historical collection with 76 more. By 1974 the College could boast of a total of 423 medical works printed before 1501.

The official bookplate of the College library, since the turn of the century, bears a modified version of the College seal. This device was adopted on 6 February 1787. The bookplate has *Ex libris coll. med. philad. instit. A.D. MDCCLXXVII* on a circular garter. Within the circle is the lamp of knowledge upon a pedestal, beneath which is the College motto. This bookplate now exists in a great variety of states. Many acknowledge the numerous donors to the library through the years. Countless booklovers and friends of the College as well as a great many of the Fellows of the College, have donated books, and many have donated money especially for the use of the library.

Acknowledgment

The author is indebted to Mr. Thomas Horrocks, curator of the library historical collections, and to Mr. Elliot Morse, former librarian of the College of Physicians of Philadelphia, for their help and advice in preparing this article.

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The Voyage of Captain Munk to Hudson Bay in 1619: An Analysis of a Medical Catastrophe

ELEANORA C. GORDON

Northern European efforts to develop a short cut to the riches of the Orient began in the mid sixteenth century after Portuguese and Spanish domination of the immensely profitable southern trade routes had demonstrated the need for an alternative path to wealth and economic growth. Cartographers, influenced by legends, ancient geographical concepts, and wishful thinking, convinced explorers and their backers that the way would be easy and profitable. The voyagers could plan a route to the north over the pole, to the east, or to the west. Only an intrepid leader, a few good mariners, some fine, well-armed ships, ample provisions, and a cargo of merchandise to set up trade with the natives were necessary.

It became apparent in a very short time that the reality was quite different. Instead of a perpetually-lit, calm, open sea, explorers encountered mountainous waves, fierce gales, snow, fog, and ice. Most of the voyages of discovery set out in May and turned back in August or September after finding the days growing shorter and the ice and fog ever more impenetrable. A few expeditions were unable to turn back, however, and their participants had to endure a forced winter sojourn in arctic or subarctic latitudes. The men on these voyages had to face not only the hardships and terror of sailing in an ice-choked sea, but also an unexpected winter in a bleak, snowy, cold, and remote land.

One such expedition was that led by Captain Jens Munk, a Dane, who was ordered by his king to seek the Northwest Passage to China. On 9 May 1619, his two ships sailed westward out of Copenhagen. Denmark's king, Christian IV, wished to make his country, which at that time included Norway, into a major maritime power, and he saw no reason for England to become the first nation to find the short cut to the East. In spite of high hopes for finding the route to the wealth of the Orient, the large and well equipped expedition ended in disaster. The ships were beset by ice on the

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This paper was presented at the Wood Institute seminar at the College of Physicians of Philadelphia on 5 November 1987.

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Figure 1. Walter A. Kenyon, ed. *The Journal of Jens Munk 1619–1620* (Toronto: Royal Ontario Museum, 1980), p. 14v.
Courtesy of the Royal Ontario Museum, Toronto, Canada.

southwest side of Hudson Bay, and the company was forced to spend the winter there. By 8 June 1620, only Captain Munk and two crewmen were left alive. They managed to get back to Denmark and brought home the melancholy tidings of failure to find the Northwest Passage, the loss of the king's ship, and the deaths of sixty-two of the company of sixty-five. A terrible outbreak of scurvy had killed most of Munk's men.[1] Two other expeditions which unexpectedly had to "winter over" endured similar hardships of cold, desolation, and scurvy, yet most of the men survived. An unsuccessful Dutch expedition to China by the Northeast Passage in 1596, led by Jacob van Heemskerck and piloted by the great navigator and cartographer, William Barents, lost four men of seventeen to scurvy before returning to Holland after a winter spent in Novaya Zemlya,[2] an island off the coast of Siberia. Thomas James' futile search for the Northwest Passage in Hudson Bay in 1631 led him to a winter sojourn on Charlton Island in James Bay. Only two of his company of twenty-three died of scurvy.[3] Although most of the men on these two voyages developed scurvy, few died from it. What conditions, therefore, caused the unusually high mortality among Munk's men? An analysis of the events and illnesses on the Danish expedition compared with the accounts of Dutch and English voyages will suggest several reasons.

Munk's account of his ordeal, *Navigatio Septentrionalis,* is an expanded version of the report he submitted to his king on his return in 1620. Even now, Munk's narrative is not widely known outside Denmark and Canada. German, Dutch, French, and English travel literature have contained brief summaries or abstracts since the eighteenth century, but the first translation of the complete work did not appear until the Hakluyt Society published its edition in English in 1897. Most modern historians of exploration never mention it. Although the outbreak of scurvy on Munk's voyage is

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1. Jens Munk, *Navigatio Septentrionalis,* Copenhagen: Heinrich Waldkirch, 1624, in *The Expedition of Captain Jens Munk to Husdon's Bay,* ed. and trans. by C.C.A. Gosch (London: Hakluyt Society, 1897). All references and details of the voyage are taken from this carefully annotated edition.

2. Gerrit de Veer, *The Third Voyage Northward to the Kingdomes of Cathaia and China in Ano 1596,* in *The Three Voyages of William Barents to the Arctic Regions,* 2nd ed., ed. by Koolemans Beynen and Charles R. Beke (London: Hakluyt Society, 1876), pp. 70–258.

3. Thomas James, *The Strange and Dangerous Voyage of Captaine Thomas James* (London: Thomas Leggett, 1633), in Christy, *The Voyages of Foxe and James,* vol. 2, pp. 451–611.

a classic demonstration of the interaction of the variables which determine the severity of the disease, almost all writings on the medical history of scurvy omit any discussion of Munk's ordeal.

Jens Munk, aged forty, was an ideal leader for King Christian's venture. He had been at sea on and off since the age of twelve, when poverty and the disgrace of having a father who was a member of the nobility jailed for embezzlement forced him out on his own. He had spent time in Portugal and Brazil in various trades. At the age of twenty-six he owned and commanded a merchant vessel which traded throughout the Baltic. He explored the west coast of Novaya Zemlya, developed the Danish whaling industry, and entered the Danish navy with the rank of captain in 1611 when Denmark went to war with Sweden. Munk had built up a reputation as an excellent navigator and an experienced, courageous, and able commanding officer.

Munk's expeditionary force consisted of two ships, the frigate *Unicorn,* which carried forty-eight men, and the sloop *Lamprey* with a complement of sixteen. The company included officers and a crew with standard ratings: four mates, bosuns, sailors, carpenters, gunners, coopers, a steward, quartermasters, cooks, and boys. Also aboard were two surgeons, a clergyman, and the officers' personal servants. The narrative does not indicate whether the crew volunteered or were recruited in a more forceful manner.

Munk's force left Copenhagen on 9 May. By 9 July, the ships were off Resolution Island on the north side of the entrance to the Hudson Strait. Munk then sailed west in search of the passage, overcoming the problems presented by gale winds and icebergs by skillful navigation and earnest prayer. Eventually he sailed directly across Hudson Bay to the large estuary of a river later named the Churchill. On 7 September the ships anchored in a harbor on the east bank now used by the modern town of Churchill, Manitoba (lat. 58°50′N.). On 18 September, after eleven days of snowstorms, Munk and his officers, deciding that the expedition should spend the winter there, brought the ships four and a half miles up river to a sheltered mooring off the western bank behind a promontory. The estuary of the Churchill forms a relatively protected lagoon about four miles wide at high tide. Although the site today bears only a few stunted conifers, Munk describes his surroundings as "wooded," and later explorers in the seventeenth century described pine, spruce,

larch, poplar, willow and balsam in the area.[4] In 1619 the site must have been at the northern edge of the boreal forest. Northwest lay the desolate Barren Grounds, and the vast expanse of Hudson Bay, with its rocky inhospitable shore, lay to the north and northeast.

Once Munk and his officers had decided to winter over, he began vigorous, efficient and organized preparations. His men beached the sloop on shore with the aid of a high tide. The crew towed the frigate a mile over rocky flats to gain the shelter of the western bank. Munk solved the problem of stabilizing the "sharp-built" frigate in the shallow water by ordering his men to have "the ship's keel . . . dug down into the ground and branches of trees to be spread wide under the bilge packed together with clay and sand in order that the ship might rest evenly on the bilge on both sides and thus suffer less damage."[5] Three times drift ice in the river knocked the ship loose, and this arduous process had to be repeated. Eventually five piles of timber and stones were placed under the bow, and *Unicorn* rested secure. The sixteen men on the sloop transferred to the frigate. Munk ordered the men to empty the hold and drag the cannon below in order to increase living space. Extra supplies were stored in storage huts on the shore.

The Captain then attended to details involving warmth and food. He distributed extra clothing and shoes. He gave orders to feed the crew on the deck in three messes of twenty men each. He had discussed the distribution and accounting of provisions with the steward earlier in the voyage:

> On the 11th of June I ascertained what quantity of provisions had been consumed, and gave definite orders as to how the stores should be served out for consumption—viz., in this wise: the steward's book...was always to be kept in the cabin; and, whenever he opened a barrel of goods, he was to enter it in the book, and, in his weekly return, to state how long it had lasted...which all was to be in keeping with the orders and rules he would receive with regard to the board, befitting the circumstances of the time.[6]

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4. C.C.A. Gosch, *Danish Arctic Expeditions 1605 to 1620*, vol. 2: *The Expedition of Captain Jens Munk to Hudson's Bay* (London: Hakluyt Society, 1897), p. 116.

5. Munk, *Navigatio*, p. 26.

6. Ibid., p. 7.

These activities show Munk as a model naval officer. He secured his ships, assessed his resources, looked after his men, and issued regulations:

> On the 10th of October, I commenced to give the men rations of wine; but beer they were allowed to drink according to their want, as much as every man himself liked. At the same time, I made regulations for keeping a watch, the fetching of wood and burning of charcoal, as well as with regard to whose duty it was to be, during the day, to melt snow into water, so that everybody knew what he was to do and how he was to conduct himself.[7]

Captain Munk attended to his crew's welfare, but occasional remarks in his journal show that he considered them an inferior class:

> However in this matter (boiling of frozen beer) I let the men follow their inclinations, because the common people, after all, are so disposed that, whatever is most strongly forbidden them, they, notwithstanding, are most apt to do on the sly, without considering whether it be beneficial or hurtful to them.[8]

Although we have no specific information about the crew's diet except for beer and wine, we can assume it included standard seventeenth-century shipboard fare: salt fish, salt meat, bread, and cheese with copious amounts of beer supplemented by rations of wine as ordered by the captain. This diet would have been adequate in the B vitamins, marginal in vitamin A, probably adequate in protein and calories, and utterly deficient in ascorbic acid.[9] The men supplemented their shipboard provisions by hunting and trapping abundant ptarmigan, arctic hares, and foxes in the woods. Depending on which parts they ate and on how thoroughly it was cooked, the game would provide a little ascorbic acid.[10] Shortly after arrival, Munk shot a polar bear who had wandered over to feast on a Beluga whale killed the previous day. He ordered his cook

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7. Ibid., p. 29.
8. Ibid., p. 31.
9. Eleanora C. Gordon, "Scurvy and Anson's Voyage Round the World: 1740–1747. An Analysis of the Royal Navy's Worst Outbreak," *American Neptune,* 1983, *44*:161.
10. Ragnar Nicolaysen, "Arctic Nutrition," *Perspectives in Biological Medicine,* 1980, *23*:307.

to "just boil it slightly and then to keep it in vinegar for a night."[11] The entire company enjoyed it. The narrative does not state how it was prepared for the crew, but the officers had theirs roasted.

The crew remained in good health and spirits through December. Munk wistfully recalls those times in his journal:

> During all the Holy Days, the weather was rather mild; and, in order that the time might not hang on hand, the men practiced all kind of games; and whoever could imagine the most amusement was the most popular. The crew, most of whom were at that time in good health consequently had all sorts of larks and pastimes; and thus we spent the Holy Days with the merriment that was got up.[12]

This was the last merriment the men were to have, for their terrible ordeal was about to begin.

Although most of the company was in good health as of the New Year, five deaths and one outbreak of illness had already occurred. Two men had died in the very early stages of the voyage. One had committed suicide and one had died suddenly after only a few days at sea. Replacements were obtained in Norway. The first death on the voyage proper occurred in a seaman on 8 August. No symptoms are given. On 9 September, just after anchoring in Churchill River estuary, Munk noted that some of the men on the sloop were ill. He gathered cloudberries, gooseberries, red whortleberries and crowberries — all excellent sources of ascorbic acid — and gave them to the men, who recovered quickly. The speedy recovery after high doses of ascorbic acid suggests that the illness was scurvy, although it is odd that Munk does not mention it by name. The men may have been experiencing the early signs of the disease — weakness, breathlessness, and lassitude, and Munk simply used the berries as an empiric remedy well known to mariners. It is also noteworthy that there had been an outbreak on the sloop but not on the frigate. However, little *Lamprey* had tossed around wildly in the angry swells and waves in Hudson Bay while riding out a gale. Her crew, perhaps not too healthy to begin with, may have undergone severe stress. Although these men recovered quickly, they

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11. Munk, *Navigatio*, pp. 24–25. Churchill is now on a migration route for polar bears who seek the ice of Hudson Bay in late fall after spending the summer in dens near the shore. The town considers itself "the Polar Bear Capital of the World."

12. Ibid., p. 36.

remained at risk for the redevelopment of scurvy during the next few months since their body stores of ascorbic acid were incompletely replenished.

The next death occurred on 21 November in a seaman "who had long been ill."[13] On 12 December the surgeon assigned to the sloop died. Many more men began to sicken after the New Year as the weather turned bitterly cold. The priest and the other surgeon, Master Casper Caspersen "took to their beds, having for some time felt very unwell."[14]

Munk describes the disease which was among them:

> After that time violent sickness commenced among the men which day to day prevailed more and more. The illness which then raged was very peculiar, and the sick were generally attacked by dysentery about three weeks before they died.[15]

Apparently a different illness had superimposed itself on men who already had clinical or subclinical scurvy. But what in the world was it? We know only that it was an enteric infection which was sometimes fatal. A shigella infection could have caused the symptoms, but there was no likely origin. The community was a closed one — there were no new arrivals, and we know most of the men were well in December. Trichinosis from the polar bear dinner could have caused severe diarrhea, but the bear was consumed in September, and gastrointestinal symptoms of Trichinosis occur during the first week of the disease. It is unlikely that Munk would have omitted mentioning bagging another bear, and, in fact, by the end of October all the bears would have migrated onto the ice on Hudson Bay. There is the possibility that some of the wild game — the ptarmigan, hares, and foxes — could have harbored bacteria or parasites, but these food were not given to all the men. Whatever the illness, it was severe, and by 21 January thirteen men were down with it.

By 16 February Munk states that only seven of the crew were healthy and that twenty persons had died. He adds a comment that, "On the same day died a seaman who had been ill the whole voyage, and one may truly say he was as dirty in his habits as an untrained beast."[16] By 1 March all the crew were sick, and in his journal entry

13. Ibid., p. 33.
14. Ibid., p. 36.
15. Ibid., pp. 36–37.
16. Ibid., p. 39.

for 4 March he states specifically that their mouths were affected with scurvy.[17]

Munk records the changing symptoms of the illness:

> As regards the symptoms and peculiarities of the illness which had fallen on us: it was a rare and extraordinary one. Because all the limbs and joints were so miserably joined together, with great pains in the loins, as if a thousand knives were thrust through them. The body at the same time was blue and brown, as when one gets a black eye, and the whole body was quite powerless. The mouth, also, was in a very bad and miserable condition, as all the teeth were loose, so that they could not eat any victuals.[18]

It is puzzling why Munk describes these classical signs of scurvy as "rare and extraordinary." Experienced mariner that he was, he certainly should have known all signs of scurvy when he saw it. He might not, however, have ever been in contact with individuals who showed severe symptoms of scurvy other than the mouth lesions after long periods of deprivation. Ten months after embarkation, then, the outbreak of dysentery has been superseded by rampant scurvy.

On 30 March, thirty-four of the company were still alive—all of them sick. Munk describes his predicament in a *cri-de-coeur*:

> . . . and at this time commenced my greatest sorrow and misery, and I was then like a wild and lonely bird. I was now obliged myself to run about in the ship, to give drink to the sick, to boil drink for them, and get for them what I thought might be good for them, to which I was not accustomed and of which I had but little knowledge.[19]

The model naval officer was confronted with a situation beyond his experience or training. There was no one left to receive orders.

Munk did his best, however. On one occasion he made a herbal bath in a wine cask and ordered all the men who were not bedridden to use it. He may have read of the benefits of a bath in the account of van Heemskerck's journey published in 1598. He gathered whortleberries for the sick men when the plants reappeared in March. Apparently the quantities were too small to reverse the ascorbic acid deficiency. He encouraged any who could still walk to go out and

17. Ibid., p. 40.
18. Ibid., p. 47.
19. Ibid., p. 42.

shoot ptarmigan for the invalids. By late spring, however, all the men's mouths were too sore to chew any meat. They could only take broth. It did not occur to him to soften bread or meat or make porridge, a method devised by James' cook to keep up the calories. So as the men weakened from scurvy, they also starved. Eventually they became too weak to go out after game or even down into the hold for supplies.

Although Munk was conscientious about caring for his disabled crew, he nonetheless made unreasonable demands on those who were still ambulatory. On 11 March he gave orders to shovel and sweep the snow off the decks, although there were few men who could do the work. A very pious man, he attached great importance to the proper burial of the dead, even though the ground was frozen. It is hard to understand how his weak and scurvy-ridden crew could have done this backbreaking labor. Munk even ordered a coffin made for his lieutenant, "the honorable and well-born gentleman Mauritz Stygge," in spite of a scanty supply of fuel and men too weak to fetch wood from the shore. He admits that "It was with great difficulty that I got a coffin made for him."[20]

On 28 May, Munk wrote that only seven miserable persons were still alive, too weak to do anything. On the fourth of June, Captain Jens Munk, lying immobile amid the three unburied corpses on his ship, wrote a note for anyone who might discover his body. He requests a Christian burial for himself and the others, and he asks that the finder deliver his journal to his king. He closes with a desolate farewell: "Herewith good-night to all the world, and my soul into the hand of God . . ."[21] Two debilitated crewmen on shore, seeing Munk as he dragged himself on deck, managed to pull him across the ice to their camp on the beach. These three, the only survivors of the company of sixty-five, began to recover when they ate the first green shoots which appeared in the late subarctic spring. As their strength increased they fished and shot birds. The trio then prepared to return to Denmark. They threw the decomposed bodies overboard, transferred the necessary provisions to the sloop, refloated and rerigged it, and sailed away on 16 July. Munk the expert seaman, was able to keep the little sloop afloat in spite of close encounters with ice and storms, and the three survivors arrived in Bergen, Norway on 21 September 1620.

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20. Ibid., p. 43.
21. Ibid., p. 48.

To return to our original question: why was the mortality for scurvy so high on the Danish expedition? The men in all three companies had in common desolate surroundings, bitter cold, and an ascorbic acid deficient diet, yet the Danes died and the English and the Dutch, though debilitated with scurvy, survived and recovered when spring vegetation became available. Although a deficiency of ascorbic acid is the direct cause of scurvy, other conditions are known to increase the severity of the disease and accelerate its progress. These detrimental factors are an unfit crew, poor living conditions, concomitant illness, hard physical labor, and a lack of good supportive medical care.[22] These variables were present on Munk's expedition. His men, therefore, sickened rapidly and died. These unfavorable influences on the course of the disease either did not exist on van Heemskerck's and James' journeys, or, if present, were mitigated by skillful management. Their men became sick gradually, did not become incapacitated before spring, and few died. An analysis of these variables on the three journeys illustrates this point.

The three deaths early in Munk's voyage suggest that those responsible for hiring the men did not screen them carefully for health problems. Indeed one wonders whether the young man who committed suicide was driven to it by melancholy or conscription. On the other hand, both van Heemskerck and James personally chose young healthy volunteers.

Living conditions aboard *Unicorn* must have been crowded and dreary. Sixty-four men were berthed on a frigate which started out with a complement of forty-eight. In the beginning the cramped quarters could have facilitated the spread of the enteric disease and many other illnesses, and the cold and gloom below decks certainly intensified inevitable feelings of desolation and misery. The Dutch and the English expeditions were smaller, and the men spent the winter in houses they built on shore where they could have living space and a hearth to lessen the effects of the bitter cold which

22. Elaine P. Ralli and Sol Sherry, "Adult Scurvy and the Metabolism of Vitamin C," *Medicine,* 1941, *20*:260; John H. Crandon, Charles C. Lund, and David B. Dill, "Experimental Human Scurvy," *New England Journal of Medicine,* 1940, *223*:363; A.P. Meiklejohn, R. Passmore, and C.P. Stewart, "The Importance of Ascorbic Acid to Man," in *Lind's Treatise on Scurvy* (Edinburgh: University Press, 1953), pp. 437–438; Robert E. Hodges, James Hood, John E. Canham, Howerde E. Sauberlich, and Eugene M. Baker, "Clinical Manifestations of Ascorbic Acid Deficiency in Man," *American Journal of Clinical Nutrition,* 1971, *24*:441.

shattered glass, cracked tin flasks and froze wine casks solid. Munk, a committed seaman, built storage huts but elected to spend the winter on the ship with cooking fires on the decks.

The Danish crew's enteric illness, whatever it was, certainly accelerated the men's rapidly diminishing body stores of ascorbic acid. Those who did not die of dysentery quickly developed severe symptoms of scurvy. Neither James' nor van Heemskerck's men developed any other illness. Their scorbutic symptoms, therefore, came on much more gradually.

The hard labor performed by Munk's men, first in securing the frigate for the winter and later in burying the bodies, certainly hastened the progress of the disease. The detrimental effects of heavy physical exertion on scurvy, a notion which went out of fashion as soon as the specific cause was discovered, is now being reconsidered.[23] Heavy exertion increases metabolism of calories. Eventually catabolized tissue proteins are used as sources of energy, causing accelerated depletion of ascorbic acid. Both van Heemskerck's and James' men conserved their energy during the winter months. However they did do regular exercise and routine chores in order to keep their joints flexible. The Dutchmen, delighted to get outside when daylight returned, even played golf with curved sticks on the northernmost course ever laid out, as they went back and forth to their ship to get supplies. Munk's men did either strenuous work or none at all.

A major factor which influenced the inexorable severity of the outbreak among Munk's men was the lack of good supportive medical care. Munk's surgeon, Master Casper Caspersen, was either incompetent or too sick to function effectively. As the doctor lay mortally ill in January, having neither the strength nor the skill to help his patients, Munk asked him repeatedly for instruction in the use of remedies for the sick: "To this he answered that he had already used as many remedies as he had with him to the best of his ability and as seemed to him advisable, and that, if God would not help, he could not employ any further remedy at all that would be useful for recovery."[24] The surgeon died on 21 March, and Munk, realizing that he now had to act as physician, examined the

23. John Norris, "The Scurvy Disposition: Heavy Exertion as an Exacerbating Influence on Scurvy in Modern Times," *Bulletin of the History of Medicine,* 1983, *57*:325–337.

24. Munk, *Navigatio,* p. 37.

medicine chest. The captain, always a stickler for efficient administration, was frustrated by the lack of direction for those forced to practice medicine by default. Munk wrote, "But it was a great neglect and a mistake that there was not some little list, supplied by the physicians, indicating what these medicaments were good for and how they were to be used."[25] He suspected that Caspersen had not known enough Latin to identify the pills and potions because the priest read every label for him.

Although Munk's lack of confidence in his surgeon was understandable, the medical officer may have done the best he could. By the sixteenth century, the practice of surgery was separated by law from the practice of medicine. Maritime surgeons were trained to amputate, purge, bleed, lance abscesses, set fractures and stitch wounds, all necessary skills at sea. Problems in medicine, however, also arose on long voyages, and many surgeons did not know how to deal with them.The other expeditions were far more fortunate in their medical personnel. Master Hans Voss, the surgeon who attended van Heemskerck's men, ordered a sauna to be made out of a wine barrel, and all the men used it to soothe their aching joints. Nathaniel Bilson, Thomas James' surgeon, followed his example and ordered all sick men who could walk to sit over a tub of steaming water every morning and evening to remove stiffness from their joints. He treated scorbutic gum disease by daily debridement and he cleansed the gums twice daily to reduce infection. All men who were not bedridden were made to go into the woods for fuel or to check on the ship. James observed, "if any one kept his bed two dayes he could rise no more. This made every man striue to keep up for life."[26] Once Munk's men took to their beds they stayed there. James and van Heemskerck had medical officers who did their best to mitigate the men's symptoms by keeping them clean and comfortable, minimizing infections, and preventing contractures from scorbutic arthropathy. Munk was unlucky in that his surgeon provided no help at all.

Munk's men had to endure bitter cold, gloomy living quarters below decks, enteric infection, hard labor, and no supportive medical care. All of these conditions certainly combined to accelerate the course of scurvy and could well explain the increased mortality. But there was one other significant factor which might have has-

25. Ibid., pp. 41–42.
26. James, *Strange and Dangerous*, p. 551.

tened the course of the disease to the point of no return in many of the men. There was a failure of leadership. Munk was a conscientious officer and a superb seaman, but he was not a leader. Although he certainly did his duty in looking after his men, he could not inspire them. He based his actions on his orders and naval regulations. He was uninterested in his crew, an inferior class, as individuals.

Although he felt responsible for his men, at no time did he work alongside of them. At no time did he rally them. The crew were strangely passive. The men simply crept off to bed and died one by one. Munk, in his journal, never expresses a determination to survive. The entire company gave up, and it is this surrender which distinguishes this voyage.[27] When Munk found himself in a situation not covered in his experience or training, he did not know how to cope. He lacked the ability to devise innovative solutions. A wiser commander would not have demanded hard physical labor from sick men. Ironically the labor of burying the dead accelerated the mortality. A creative leader might have realized the importance of improvising a soft diet from the ship's stores to provide calories for men who could not chew. A heroic leader would have exhorted his men not to give up. Munk was not heroic. He was simply an unimaginative, decent, pious, conscientious man who lacked the ability to be resourceful or innovative when faced with a crisis.

Both Thomas James and Jacob van Heemskerck showed qualities of leadership. Even though they maintained their authority as commanders, fellowship with their crew developed as their predicament grew worse. They strove to survive together as a group. When Thomas James' situation seemed desperate, he told his men that they were as near heaven as in England, and since God was kind enough to give them time for repentance, He wouldn't mind at all if they tried to extricate themselves.[28] Jacob van Heemskerck kept up his men's spirits and, when all of them were weakened by scurvy, inspired them to keep at the task of refitting the two ship's boats in which they would make their voyage home. As his second mate put it, "he bad us striue to do more than we were able, saying that both our lives and our wellfare consisted therein and that if we could not get the scute from thence and make it ready, then he said

27. The detrimental influence of apathy on survival in desperate circumstances is well recognized. See Karen Ordahl Kupperman, "Apathy and Death in Early Jamestown," *Journal of Early American History,* 1979, 66:24–40.

28. Ibid., p. 524.

we must dwell there as bergers of Nova Zembla and make our graues in that place."[29] Thomas James and Jacob van Heemskerck coped with the problems of cold and illness by skillful planning and creative solutions. They fostered a climate of confidence, instilled the will to survive—and the men hung on.

Scurvy, exacerbated by a concomitant illness, exertion, poor care, and apathy killed off Munk's men. One wonders if a less rigid, more caring and inspiring leader could have kept them alive until the green grass came in the spring.

In the summer of 1620 Indians, who came to the shores of Hudson Bay to fish, found the remains of Munk's encampment and many bodies heaved out of the ground. The efforts of the feeble burial crew had all been in vain. The natives' description of the corpse-strewn site was passed down as an oral tradition and eventually reached French civil servants stationed in the area. Traders of the Hudson's Bay Company found the cannons in 1717.[30]

Hudson Bay, a dead end on the short cut to the Orient, became the gateway to the lucrative fur trade. The quest for the Northwest and the Northeast Passages went on, and scurvy, cold and desolation continued to plague the searchers. Eventually two explorer-geographer-scientists used the benefits of accumulated wisdom, technological progress, and accurate cartography to achieve success. Nordenskiold traversed the Northeast Passage north of Siberia in 1897, and Amundsen sailed west to Alaska by way of Lancaster Sound in 1903. Theirs was a hollow triumph, however, for there was no longer the prospect of commercial gain from the impractical and inhospitable polar route. The advent of steam had made the world smaller, and the search for the Passages had become a *tour de force* rather than an economic necessity.

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29. de Veer, *Third Voyage,* p. 180.
30. Gosch, *Expedition,* pp. 133–135.

The Vienna College of Physicians and Its Sesquicentennial

(Gesellschaft der Ärzte in Wien, 1837–1987)

KARL HOLUBAR

Ganz vergessener Völker Müdigkeiten
Kann ich nicht abtun von meinen Lidern,
Noch weghalten von der erschrockenen Seele
Stummes Niederfallen ferner Sterne

Hugo von Hofmannsthal (1874–1929)[1]

The College of Physicians of Philadelphia celebrated its Bicentennial in 1987. The Vienna College of Physicians had its Sesquicentennial in the same year in a city with a five-hundred-year-old university.

Vienna is a city of many venerable centers of learning. Vienna University was founded in 1365, and the Medical School in 1389. In Central Europe only Prague (1348) and Cracow (1364) are older. The Wiener Medizinisches Doktoren-Collegium dates back to this time.[2] This society had social and charitable obligations and served as a society for all the doctors in both the city and the faculty, not as a forum for scientific exchange in a modern sense. As we shall see, the Collegium was dissolved in 1938.

The Medical School in Vienna flourished after Maria Theresa called Gerard van Swieten (1700–1772) from Leiden to its chair of medicine in 1754. Under his aegis the First Vienna School, which led Europe in the latest medical science, was established. The leader of this effort was Johann Malfatti (1775–1859), a remarkable Italian who came to Vienna with Johann Peter Frank in 1795. After 1802, and for well over a decade, Malfatti hosted regular private meetings of a group of physicians interested in the mutual exchange of information on medical and therapeutical problems of the city.

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1. All forgotten peoples' tiredness
Cannot remove from my eyelids,
Nor keep away from the startled soul
The silent falling of faraway stars.
Translated by Hermine Henry.

2. Wissenschaftlicher Ausschuss des Wiener Medizinischen Doktorenkollegiums, ed. *Medizinisches Seminar* iii, forward (Vienna: Springer, 1926).

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After the termination of the Napoleonic wars, the political climate in Austria was not conducive to any similar endeavors; the state was suspicious of all gatherings and assumed revolutionary concepts even behind medical discussions.

At the time of the cholera epidemic of 1831, such efforts arose anew in medical circles of the city. It took several years until these attempts bore fruit. In March of 1837, verbal permission was granted by Emperor Ferdinand I, who reigned 1835–1848, to found a "Gesellschaft der Ärzte" (College of Physicians).[3] The mastermind of this process was Johann Malfatti. Another influential person was Franz Wirer (1771–1844), later knighted as Ritter von Rettenbach. He was a *doctor medicinae et chirurgiae* and in 1836/1837 *rector magnificus* of Vienna University. Formal permission to found the Vienna College of Physicians was given by the authorities on 14 November 1837, after months of deliberations, and on 22 December 1837 the constituent meeting took place. Johann Malfatti, by then knighted as Edler von Monteregio, was elected first president after Wirer and others had turned it down. On 24 March 1838, a ceremonial opening session was held in the building of the university now called Old University, because a new main building for the university was erected later in the nineteenth century. Prince Metternich, the chancellor, two archdukes, and many other dignitaries of church and state attended this ceremonial meeting.[4]

The Golden Age of the Vienna College of Physicians

The College intended to have about 30 to 40 regular (ordinary) members as well as extra-ordinary, honorary, and corresponding members. Dues for regular members were 20 florins, for extraordinary members half that amount. The College was permitted to carry the imperial eagle in its seal and call itself "k.k." i.e. kaiserlich königliche (imperial royal) Gesellschaft der Ärzte. The foundation was declared publisher of the government's official gazette, the *Wiener Zeitung,* and still serves this purpose today as the oldest newspaper in the world in continuous edition.[5]

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3. I. Fischer, *Geschichte der Gesellschaft der Ärzte in Wien 1837–1937* (Vienna: Springer, 1938).

4. Ibid.

5. Ibid.; F. Stamprech, *Die älteste Tageszeitung der Welt* (Vienna: Österr Staatsdruckerei, 1977).

The College had four sections: (i) physics, chemistry, natural history; (ii) anatomy, physiology, psychology and comparative anatomy; (iii) theoretical and practical medicine, forensic medicine, pathology and veterinary medicine; (iv) theoretical and practical surgery, ophthalmology, obstetrics and dental medicine. Malfatti served as president of the College from 1837 to 1841.

The College flourished under his successors and, after 1844, published a journal, benefitting from the rise of the "Second Vienna School." The leaders of this school were the pathologist Carl Rokitansky (1804–1878), the internist Joseph Skoda (1805–1881), and the dermatologist Ferdinand Hebra (1816–1880). Rokitansky served as the fourth president of the Vienna College of Physicians, for 28 years, followed by Hebra, who served for two years.

The following decades reflect the glory of Viennese Medicine in the second half of the last century and up to World War II.[6] Ignaz Phillipp Semmelweis (1818–1865) presented his important findings on puerperal sepsis in 1850. Three years before, Hebra had filled in for the shy Hungarian, and had thus given the first report on this work. Johann Czermak (1828–1873) and Ludwig Türk (1810–1868) battled in 1858 over priority in the design of a suitable technique for laryngoscopy; Leopold Dittel (1815–1898) demonstrated his cystoscopy. Samuel Siegfried Karl Basch (1837–1905) displayed his sphygmomanometer to measure blood pressure. Johann von Mikulicz-Radecky (1850–1905) presented his esophagogastroscope in 1881. Theodor Billroth (1829–1894) carried out the first successful gastrectomy in 1881, and reported on it to the College. Carl Koller (1856–1944) demonstrated the anesthetic action of locally applied cocaine (provided by Sigmund Freud) in 1884. Sigmund Freud (1856–1939) spoke on "hysteria in the male" in 1886. Leopold Freund (1868–1943) demonstrated the first patient treated with x-rays in 1897. In addition, the Nobel prize winners, Karl Landsteiner (1868–1943), Robert Barany (1876–1936) and Julius Wagner-Jauregg (1857–1940) had been active in this forum, as was Clemens von Pirquet (1874–1929).

During the first 20 years, the Vienna College of Physicians had no permanent home. In 1857, the building of the Old University, (which housed and still houses the Austrian Academy of Sciences), became the site for the meetings and for the growing library of the

6. E. Lesky, *Die Wiener Medizinische Schule im 19 Jahrhundert* (Graz-Köln: Böhlau, 1965).

Figure 1. Lecture hall of the building of the College of Physicians of Vienna. The busts in the lunettes are of former presidents: Carl von Rokitansky, center (1804–1878); Ferdinand von Hebra, left corner (1816–1880); Joseph Skoda, center bannister (1805–1881).

College. Thirty-six years later the present building was opened under Theodor Billroth's tenure as president of the College, on 27 October 1893. This building and its facilities are still in use today, looking virtually identical to what may be seen in old photographs (see Fig. 1).

Centenary and Crisis

In 1868 the Vienna College of Physicians had 200 members, by 1897 more than 500, by 1922 more than one thousand; a flare

before the extinction.[7] In 1937 the centenary of the foundation was celebrated on two successive Fridays, 21 May and 28 May, in the auditorium maximum of the university, to accommodate all guests. On the first date, the federal president, the chancellor, three ministers, the mayor of the city, and 500 guests convened. Max Neuburger (1868–1955), professor of the history of medicine, was the festive orator. On the second occasion, the famous surgeon Ferdinand Sauerbruch (1875–1951) and Isidor Fischer, the College's historian (1868–1943) delivered lectures.

Less than one year later, with the rise of the Nazis, the end of the Vienna College of Physicians was imminent. The last regular session was held Friday, 11 March 1938, the evening before the Anschluss. Isidor Fischer, the historian, who had spoken at the centenary, and whose book was in print at the time, was not mentioned as an author when the volume actually appeared because he was a Jew. The College was forced to serve collectively as author. On 29 September, Fischer resigned as a member. He escaped to England and died in Bristol in 1943.

The expulsion of the Jewish members and of other politically inconvenient persons made the membership drop from more than one thousand to about 350. During the course of the year 1938, attempts were made to ensure the survival of the College as a separate society. The attempts proved unsuccessful. A merger with the above mentioned Doktoren-Collegium was ordered and, on 14 October 1938, its existence was formally cancelled. On 16 December 1938, the Doktoren-Collegium also ceased to exist. During the ensuing years of World War II, a so-called Wiener Medizinische Gesellschaft (Viennese Medical Society) served as a forum for physicians, subject to the Reichsärztekammer (Central Board of Doctors) in Berlin.[8]

On 20 June 1945 the first meeting of surviving members of the Vienna College of Physicians took place. Before long, the Vienna College of Physicians was also legally re-established and slowly a

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7. I. Fischer, *Geschichte der Gesellschaft der Ärzte in Wien 1837–1937* (Vienna: Springer, 1938).

8. K. Sablik, "Untergand und Wiedergeburt (1938–1945)," In *Gesellschaft der Ärzte in Wien 1837–1987*, K.H. Spitzy, (ed.), (Vienna: Brandstätter, 1987), pp. 39–55.

rather normal course of Friday evening sessions could be planned.[9] Never again did the College assume the place it held before World War II: that of a major forum for Central European Medicine. Central Europe, as a political nucleus of the continent, no longer existed, and the German language ceased to play a significant role in international medicine.

The cataclysms of the twentieth century that so moved us, have also influenced the history of the College: the destruction of the Old Monarchy, which removed more than fifty million people as potential talented citizens, and World War II with the holocaust and the expulsion of the Jews, had devastating and lasting effects.

Sesquicentennial Celebrations

The Sesquicentennial was celebrated in the month of March, 1987 since the first, though only verbal, permission to found the college had been given in March 1837. On the first day, 18 March, a ceremonial mass was held in the church of the university by the Archbishop of Vienna. The next day guests visited the historic home of the Vienna College of Physicians, called the Billroth-House; it opened in 1893 under Billroth's tenure as president of the College.

In the evening, a special session was held at the College, under the motto from Billroth, "Arts and sciences spring from the same source." A contribution was made to the pathography of Ludwig von Beethoven, who had been a patient of Johann Malfatti.[10] Readings by poets and actors followed and music was played by a doctors' orchestra of the university.

On Friday, 20 March, an "ordinary" College Night took place with an oration by the surgeon, H. Zangl, on the "The Education of the 'Elite' Physician — a Contemporary Look at Theodor Billroth's Legacy." The internist A. Neumayr spoke on "Billroth and Music," as Billroth was a close friend of Johannes Brahms. Saturday, 21 March, the last day of the celebration was heralded by a collegium publicum on "Abdominal Surgery in Inter-Disciplinary Perspective." This concluded the four-day event.

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9. H. Wyklicky, "Das erste Lustrum im Neuerstandenen Österreich (1945–1950)," In *Gesellschaft der Ärzte in Wien 1837–1987,* K.H. Spitzy, (ed.), (Vienna: Brandstätter, 1987), pp. 56–62.

10. B. Pincherle, "Giovanni Malfatti: Medico di Beethoven e del Duca di Reichstadt," *Boll Ist Storico Ital dell'Arte Sanitaria,* 1931, *30*(1), Jan–Feb.

In October 1987 the author of this article, the only member of both colleges, had the honor to deliver the third Frank Kral Lecture before the Section on Dermatology of the Philadelphia College of Physicians.[11] In order to convey the wishes and congratulations of the Vienna College of Physicians to its venerable older sister, a small gift was presented: an original edition, in Latin, of "Doctrina de morbis cutaneis" by Joseph Plenck (1735–1807) published in Vienna in 1776. Plenck, a Viennese, had had the original idea to classify skin diseases according to efflorescences, an approach subsequently developed by Robert Willan (1757–1812), one of the fathers of European dermatology. In turn, Lewis Coriell, M.D., Ph.D., president of the Philadelphia College of Physicians, presented an original print of Benjamin Rush to the Vienna colleagues. This print hangs next to the painting of Johann Malfatti and adorns the room of the board of directors in the building of the Vienna College of Physicians in Vienna.

Prospects for the Future

Today the Vienna College of Physicians has more than 1500 members. Over the last 150 years a total of 374 honorary members including the great medical scientists of Europe were elected, as well as 217 corresponding members.

Together with the historical building, the library is the greatest treasure of the Vienna College of Physicians. Some 2000 different journals have been acquired over the last century and a half. Currently about 500 journals are regularly received (down from almost 700 in earlier years). In this respect it is the most comprehensive medical library in the country, and one of the best medical libraries in continental Europe. In the future, the library of the Vienna College of Physicians will serve as a nucleus of a central medical library of the Medical School in Vienna, into which all libraries of clinical departments, theoretical institutes, the old faculty library, the medico-historical library, etc., will be incorporated.

As can be gleaned from the above, the number of journals received has been cut due to the ever rising costs. Nevertheless, the journals definitely are a great resource for readers and/or members of the college. The situation is quite different with regard to the

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11. K. Holubar, "Pemphigus — A Disease of Man and Animal," (Third Frank Kral Lacture, Philadelphia, 14 October 1987) *Intl. Journal Dermatology*, in press.

standard activities, i.e. the regular Friday evening sessions. Attendance is low, perhaps because of the increasing specialization in medicine and the rising number of interdisciplinary societies. Only the introduction of a special Saturday morning feature, a *collegium publicum* which provides Continuing Medical Education credit, is able to fill the college audience with young graduates who have no employment or place for internship. The College hopes that these young graduates will over time become accustomed to the place and its facilities, and will function as a pool for new members (and talents). This problem remains for our profession to ponder.

Historically speaking, Colleges of Physicians in many places have served their purpose well for two centuries or more. The trend to specialize, split disciplines, and create new fields of expertise has posed new challenges for general medical institutions like the College of Physicians of Philadelphia and the Vienna College of Physicians.

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As Far as the Eye Can See: Ophthalmology in the Historical Collections of the Library of the College of Physicians of Philadelphia

THOMAS HORROCKS

When a young Philadelphia medical student, William Fisher Norris (1839–1901), informed his parents and friends that he was going to specialize in diseases of the eye, he had to convince them that he was not intending to become a charlatan. The distrust of specialists exhibited by Norris' family and friends mirrored the views of a large majority of physicians, who prided themselves in being able to treat a wide variety of ailments and conditions. To them, specialists, particularly "eye doctors," conjured up images of quacks and mountebanks.

Norris overcame this prejudice because of his reputation, social standing, and his contributions to ophthalmology. Moreover, when he entered the field during the mid nineteenth century, ophthalmology was establishing itself as a legitimate scientific specialty. During the first half of the century, the founding of eye hospitals and clinics, the creation of professorships, and the contributions of pioneering eye specialists raised ophthalmology's status in the medical world. Despite advances in the field, research on the eye up to this time had been external and superficial. It was not until a few years before Norris' decision to study ophthalmology, with the invention of the ophthalmoscope in 1851, that ophthalmologists were given the opportunity to understand better the anatomy, pathology, and physiology of the eye. The advent of the ophthalmoscope and subsequent developments in microscopy enabled ophthalmologists to broaden and deepen their perspective on the eye. They now could look not only *at* the eye, but *into* it. Whereas physicians in other fields of medicine were able to broaden their perspective of disease and its effects on the body by looking at the body's organs, tissues, and cells, ophthalmologists now investigated the eye's interior and related what they saw to conditions significant for other areas of the

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body. Advances made by ophthalmologists during the late nineteenth century built a medical-scientific foundation upon which later achievements would rest.

The progress of ophthalmology, from medieval speculations to the impact of the ophthalmoscope, is well documented in the extensive holdings of the Historical Collections of the Library of the College of Physicians of Philadelphia. While the department has strong holdings in virtually every field of medicine, it is particularly rich in ophthalmological works. This superb assemblage of books and manuscripts relating to ophthalmology is one of the finest in the world. This unique ophthalmological collection (more than 6,000 volumes), like the Historical Collections in general, was amassed primarily through the generosity of generations of Fellows and friends of the College of Physicians. The beginnings of the library's ophthalmology collection can be traced back to Samuel Lewis (1813–1890), who donated 2,500 books to the College in 1863. Among the many rare works presented by the Philadelphia physician-bibliophile were a number of ophthalmology books, many of which Lewis purchased in Europe. Prominent Philadelphia ophthalmologists, such as Norris, William Thomson (1833–1907), John F. Weightman (1847–1886), George E. de Schweinitz (1858–1938), Samuel Lewis Ziegler (1861–1926), James Thorington (1858–1944), William Zentmayer (1864–1958), and Burton Chance (1868–1965) followed the example set by Lewis, donating and bequeathing books, often their libraries, and their personal papers to the library of the College.

A detailed survey of the Historical Collections' ophthalmology holdings would require a book-length study, so this essay presents but a selection of some of the most significant works in the collection — significant because of their rare nature and/or their impact on the development of ophthalmology.

One of the oldest treasures in the Historical Collections of the Library is a fourteenth-century manuscript of Arnold of Villanova's *De infirmitatibus occulorum* (Italy, ca. 1350). One of the most influential physicians of the Middle Ages, Arnold of Villanova (1240?–1311) is credited with over sixty works on medicine, including ophthalmology. His manuscript on the infirmities of the eye, presented to the library of the College in 1894 by S. Weir Mitchell (1829–1914), contains one of the earliest drawings of medieval instruments used in eye surgery (see Fig. 1).

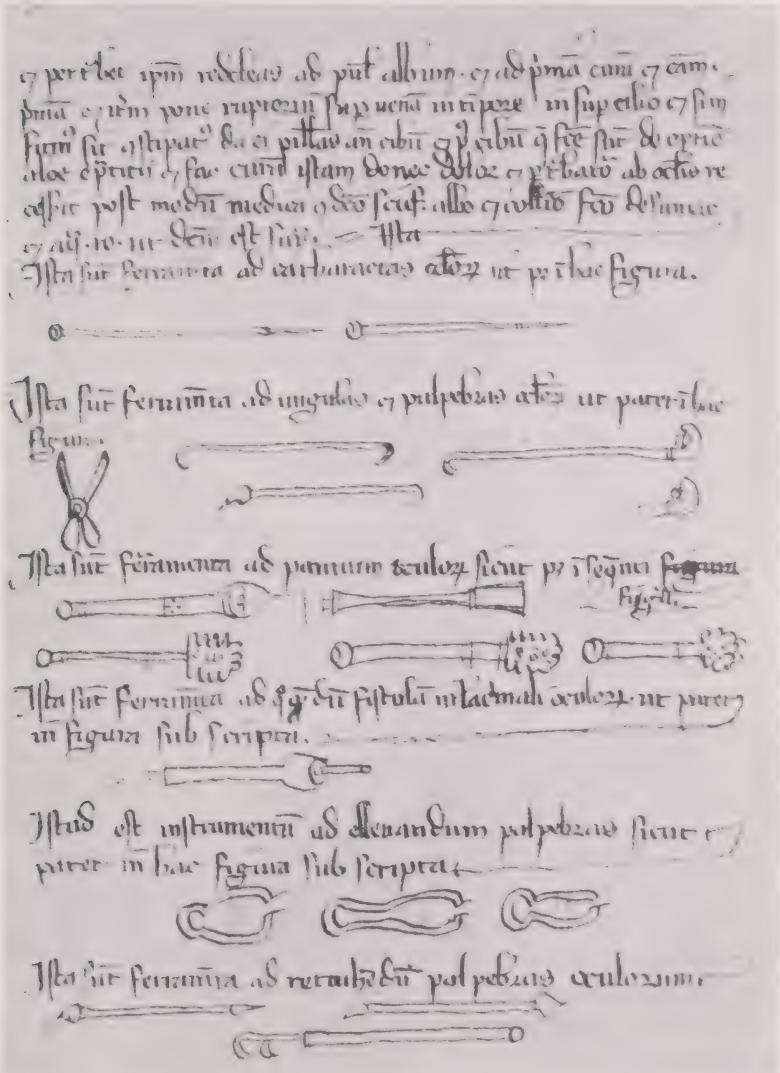

Figure 1. Medieval Instruments used in eye surgery from Arnold de Villanova's *De infirmitatibus occulorum* (ca. 1350).
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

Included among the 423 incunabula in the Historical Collections is Benvenutus Grassus' *De oculis eorumque aegritudinibus et curis* (Ferrara, 1474), which is the earliest printed book on ophthalmology. This work by Grassus, who was the most celebrated ophthalmic surgeon during the Middle Ages, was acquired by the College in 1901, when it purchased the library of John Stockton Hough (1845–1900), a Trenton, New Jersey physician-book collector.

The best known ophthalmology work of the sixteenth century, and the one which is regarded as the first modern work on eye surgery, is Georg Bartisch's *Augendienst* (Dresden, 1583). Bartisch (1535–1607?) made a reputation as a skillful operator and a keen observer. The first ophthalmology book printed in German, the *Augendienst* contains ninety-one extraordinary woodcuts which were based on the author's original drawings (see Fig. 2). The *Augendienst* came to the College in 1903 as part of William Fisher Norris' 1,177 volume library, which was donated by Norris' family. Norris' library comprised one of the most valuable ophthalmological collections in the country at the time of his death in 1901.

A fine example of a seventeenth-century ophthalmological work in the Historical Collections is the first French edition of René Descartes' *L'homme* (Paris, 1664). Part of *L'homme* is devoted to Descartes' ideas regarding the physiology of vision and contains remarkable woodcuts, which were partly based on his drawings (see Fig. 3). Descartes (1596–1650) was prepared to publish this work thirty years earlier, but withheld publication out of fear of condemnation by the Church, thus the first Latin edition was not published until two years before this edition. The library acquired Descartes' *L'homme* in 1901 as part of the collection of John Stockton Hough.

The ophthalmology holdings of the Historical Collections are particularly strong in eighteenth and nineteenth-century imprints, especially those published in France, Austria, Germany, Great Britain, and the United States. Antonio Scarpa's *Saggio di osservazioni e d'esperienze sulle principali malattie degli occhi* (Pavia, 1801) was the first ophthalmology text published in the Italian language. In this work Scarpa (1752–1832), considered the "Father of Italian ophthalmology," described the operation of iridodialysis. This book, with its superb copperplate engravings (see Fig. 4), was donated to the College Library by the prominent Philadelphia physician Alfred Stillé (1813–1900), who was president of the College during the years 1883–1884.

Figure 2. A woodcut depicting a cataract operation from Georg Bartisch's *Augendienst* (1583).
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

Figure 3. A woodcut from Descartes' *L'Homme* (1664).
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

A number of important ophthalmological works came out of France during the eighteenth century and one can find many of these in the Historical Collections. Antoine Maître-Jan's *Traité des maladies de l'oeil et des remèdes propres pour leur guérison* (Troyes, 1707) is significant because Maître-Jan (1650–1730) was the first to mention retinal detachment. His energetic support of the theory of the true nature and location of cataract, advanced by his contemporary Michel Brisseau (1631–1717) a few years earlier, ensured

Figure 4. A copperplate engraving from Scarpa's *Saggio di osservazioni e d'esperienze sulle principali malattie degli occhi* (1801).
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

its acceptance. Two other significant works from the eighteenth century are Charles de Saint-Yves' *Nouveau traité des maladies des yeux* (Paris, 1722) and Guillaume Pellier de Quengsy's *Précis ou cours d'opérations sur la chirurgie des yeux* (Paris and Montpellier, 1789–1790). In the former work, Saint-Yves (1667–1736) presented several innovations in eye surgery and was the first to de-

scribe gonorrheal ophthalmia. The two-volume work by Quengsy (1751–1835), which includes 34 engraved plates, was the first text devoted exclusively to eye surgery. One early nineteenth-century work that deserves mention for its contribution to ophthalmic pathology is Antoine Pierre Demours' *Traité des maladies des yeux* (Paris, 1818). The atlas which accompanies this three-volume work contains sixty-five extraordinary hand-colored plates. Samuel Lewis Ziegler (1861–1926) presented this ambitious work by Demours (1762–1836) to the library. Ziegler practiced ophthalmology in Philadelphia.

The Viennese school of ophthalmology is strongly represented in the Historical Collections of the library. The founder of that school, Georg Joseph Beer (1763–1821) wrote *Lehre der Augenkrankheiten* (Vienna, 1792), a work which dominated the field for many years. Many of Beer's students at the University of Vienna became famous eye surgeons. Ferdinand Arlt (1812–1887), considered the greatest figure of the Viennese tradition, held a post as professor of ophthalmology at the University of Vienna from 1856 to 1883. His most famous work is the three-volume *Die Krankheiten des Auges* (Prague, 1851–1856). The work went through three editions in as many years, reflecting its major influence in the field. All three editions are in the Historical Collections. Arlt was succeeded at the University by Karl Stellwag von Carion (1823–1904), Eduard Jaeger (1818–1884), and Ernst Fuchs (1851–1930). A number of Stellwag's works are in the Historical Collections, including his most important one, *Lehrbuch der praktischen Augenheilkunde* (Vienna, 1861). The department also owns a copy of Fuchs' *Lehrbuch der Augenheilkunde* (Leipzig and Vienna, 1889), which was subsequently translated into many languages. Besides owning Jaeger's famous *Ophthalmoskopischer Hand-Atlas* (Vienna, 1869), the department is fortunate to have 142 of his hand-colored drawings of the eye which were published in the atlas. With the invention of the ophthalmoscope, Jaeger was able to conduct extensive research on the fundus of the eye and these drawings were produced from that research. After Jaeger's death, William Fisher Norris, who had studied with Jaeger for a brief period in Vienna, purchased the drawings and a volume of the latter's manuscript notes pertaining to his research for $2,400. After Norris' death they were donated to the College by his family.

The first journal devoted to ophthalmology was published in Germany. Founded by Karl Himly (1772–1837), a professor of

ophthalmology at Jena and later at Gottingen, the *Ophthalmologische Bibliothek* was issued from 1803 to 1807. The family of William Fisher Norris gave this journal to the Library. Friedrich August von Ammon (1799–1861) was also involved in editing an ophthalmology journal, but it is his magnificent *Klinische darstellungen der Krankheiten und Bildungsfehler des menschlichen Auges* (Berlin, 1838–1847) that concerns us here. The best summary of the knowledge of eye disease up to that time, Ammon's beautiful atlas is illustrated with fifty-five engraved plates, which were colored by hand. This copy once belonged to the Philadelphia ophthalmologist, John F. Weightman, and was presented to the College by his widow in 1886.

Dr. Weightman also owned a small forty-nine page monograph which is considered the greatest work in ophthalmology, Herman Helmholtz's *Beschreibung eines Augen-Spiegels zur Untersuchung der Netzhaut im lebenden Auge* (Berlin, 1851). It was in this book that Helmholtz announced his invention of the ophthalmoscope. The best known nineteenth-century ophthalmological atlas is Richard Liebreich's *Atlas der Ophthalmoscopie* (Berlin, 1863). Liebreich (1830–1917) later left Germany and moved to England, where he became a surgeon at St. Thomas' Hospital in London.

Because of the taint of quackery in the eighteenth century, ophthalmology did not gain respectability in Great Britain until the nineteenth century. (This elevation in status is attributable to the establishment of a number of eye hospitals during the period and the important work carried out in their wards.) The Historical Collections owns a number of nineteenth-century British works, starting with James Wardrop's *Essays on the Morbid Anatomy of the Human Eye* (Edinburgh and London, 1808–1818) and Benjamin Travers' *A Synopsis of the Diseases of the Eye* (London, 1820). Both of these works contain remarkable illustrations. The work by Travers (1783–1858), who was a pupil of Sir Astley Paston Cooper (1768–1841) and a surgeon at the London Infirmary for Diseases of the Eye, is regarded as the first systematic treatise in English on the diseases of the eye.

William Mackenzie (1791–1868), one of the foremost ophthalmologists of his time, helped found of the Glasgow Eye Infirmary in 1829. A year later he published his important *A Practical Treatise on the Diseases of the Eye* (London, 1830), which became one of the most popular English language textbooks on ophthalmology. Another classic work is John Dalrymple's *The Anatomy of the*

Human Eye (London, 1834), which Dalrymple followed twenty years later with his *Pathology of the Human Eye* (London, 1852). The former work is the first book in English devoted to ocular surgery. Sir William Lawrence (1783–1867) was once an assistant to Benjamin Travers and a surgeon to Queen Victoria. His *A Treatise on the Diseases of the Eye* (London, 1833) was a significant contribution to eye surgery. Andrew Maitland Ramsay (1859–1946), a Glasgow ophthalmic surgeon, made use of photography in his *Atlas of External Diseases of the Eye* (Glasgow and New York, 1898). Graphically illustrated with eighteen photogravures and thirty chromolithographs, Ramsay's *Atlas* depicts a number of pathological conditions which he treated at the Glasgow Eye Infirmary (see Fig. 5). Ramsay's work was donated to the Library by George E. de Schweinitz in 1898.

The Historical department is particularly strong in American works on ophthalmology. The department owns a number of manuscript collections in this area as well. Philadelphian Philip Syng Physick (1768–1837) was the most celebrated American surgeon of his time, and one of his many contributions to surgery was a procedure for cataract extraction. The Historical Collections holds a volume of his lecture notes on surgery from 1807–1808 which includes a section on cataracts. These notes were never published until his nephew, John Syng Dorsey (1733–1818) published his *Elements of Surgery* (Philadelphia, 1813), which included a summary of his uncle's lectures on the treatment of eye diseases.

One of Physick's students at the medical school at the University of Pennsylvania was George Frick (1793–1870), who was a native of Baltimore. Frick's *A Treatise on the Diseases of the Eye* (Baltimore, 1823) was the first American textbook on ophthalmology. Founder of an eye clinic at the Baltimore Dispensary, Frick was one of the first American physicians to devote his career to ophthalmology. John Mason Gibson wrote the second American ophthalmology textbook, *A Condensation of Matter upon the Anatomy, Surgical Operations and Treatment of Diseases of the Eye* (Baltimore, 1832). The Collections own both works.

Philadelphia is well represented in the College's ophthalmology collection. This is not surprising, for the city has taken the lead as a center for ophthalmology since the early nineteenth century. Throughout the years, Philadelphia's physicians, many as members of the College, have made significant contributions to the field. Important works by prominent Fellows, such as Squier Littell

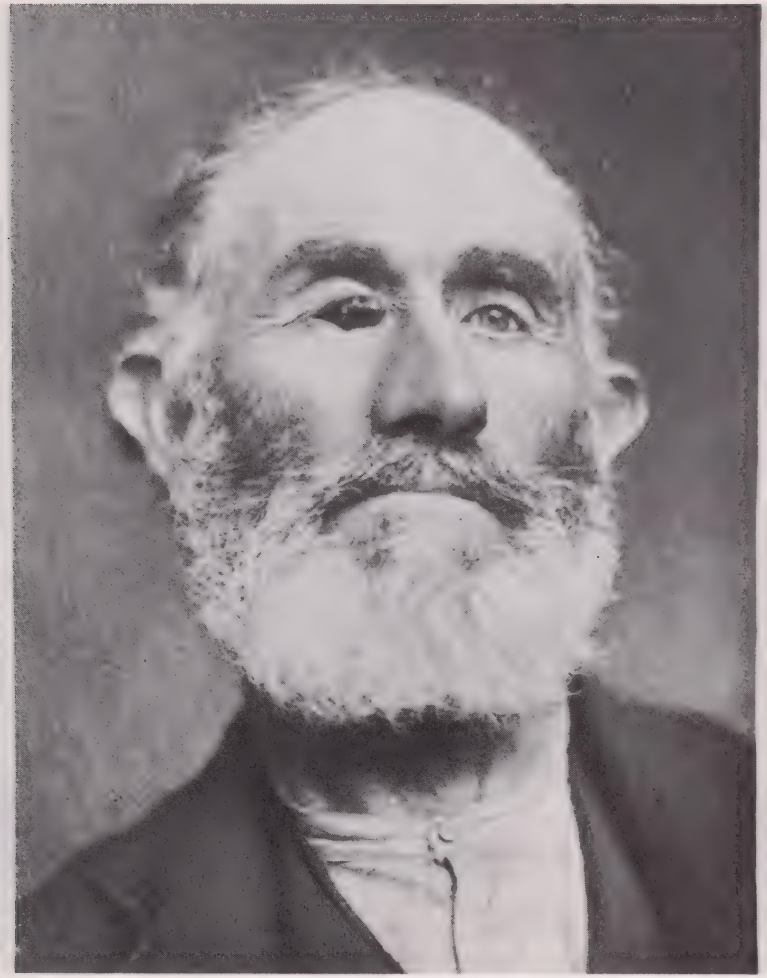

Figure 5. One of the graphic photo-gravures from Andrew Maitland Ramsey's *Atlas of the External Diseases of the Eye* (1898).
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

(1803–1886), George E. de Schweinitz, and William Fisher Norris (including a rare 1894 Chinese edition of his *Text-book of Ophthalmology*) can be found in the Historical Collections. As indicated above, Norris's family donated his magnificent library to the College, and among the treasures therein was a collection of hand-colored drawings made from Norris' cases from the last twenty-six

Figure 6. Edema of the ocular conjunctiva. Color drawing by Margaretta Washington, one of a collection of hand colored drawings of cases from the practice of William Fisher Norris (1874–1901).
Courtesy of the Library, College of Physicians of Philadelphia.

years of his life. These breathtaking drawings, most of which were done by Margaretta Washington and Hermann Faber, are accompanied by case notes on interleaved paper (see Fig. 6). The patients were treated by Norris at the Wills Eye Hospital and the Hospital of the University of Pennsylvania.

The personal papers of a number of Philadelphia ophthalmologists are preserved in the Historical Collections, including those of William Thomson, de Schweinitz, Samuel Lewis Ziegler, William Zentmayer, James Thorington (in this collection one will find

the eye examination records of Will Rogers and William Welch), and Burton Chance. Of course, the archives of the College's Section on Ophthalmology, formed in 1892, are also available for research.

This essay presents only a small sample—the tip of a very large iceberg—of the extensive ophthalmology holdings of the Historical Collections of the Library. Scholars interested in the history of ophthalmology will find this collection an invaluable resource. Whether studying the advances made during a particular period, contributions by an individual school or country, or the great works of individuals, researchers have a rich abundance of material at their disposal in this important collection—a collection that extends as far as the eye can see. Well, almost.

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Philadelphia Seen: Two Centuries of Ophthalmology

GRETCHEN WORDEN

Introduction

"Philadelphia Seen: Two Centuries of Ophthalmology" is the result of a collaboration between the College's Mütter Museum and its Section on Medical History. As Section chairman, Dr. Eleanora Gordon initiated the project. Dr. Gordon wanted to highlight the museum's role in Philadelphia medical history by arranging a Section program which combined a special museum exhibit with a speaker on the same theme. One aspect of the exhibit was to be a hands-on display of artifacts which the audience could touch and use.

With these requirements — a major collection, with special Philadelphia significance, that would lend itself to audience participation — the choice was obvious: ophthalmology. The selection of an appropriate speaker was also easy. Dr. Daniel M. Albert had written extensively on the history of ophthalmology, and his *A History of Ophthalmology at the University of Pennsylvania*, co-authored with Dr. Harold G. Scheie, was an invaluable reference for the design and labelling of the exhibit and for this article which emphasizes Philadelphia ophthalmology.[1]

Dr. Albert's topic, "Contributions of Philadelphians and Their Neighbors to Nineteenth-Century Ophthalmic Literature," provided a natural opportunity to add a library component to the museum's exhibit. The College's library, like its museum, reflects the activity and interests of the Fellows over the 200-year history of the organization, and the strengths of the two collections are complementary.

The written and artifactual records of the specialty's development in Philadelphia show the same pattern of dependence on the work of European anatomists and surgeons in the late eighteenth and early nineteenth centuries, with ever increasing numbers of original American contributions as the specialty became defined toward the latter half of the nineteenth century. The first specialized

1. D.M. Albert and H.G. Scheie, *A History of Ophthalmology at the University of Pennsylvania* (Springfield, IL: Charles C. Thomas, 1965), pp. 5–17.

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ophthalmic instruments were surgical, as were the texts, until Helmholtz's invention of the ophthalmoscope in 1850 opened up the interior of the living eye to the inspection of the anatomist, pathologist, and physician. The technological armamentarium of the ophthalmologist expanded dramatically in the second half of the nineteenth century to include a great variety of instruments and apparatus used to systematically and objectively diagnose muscular and refractive errors. Again, Philadelphians who trained abroad, in the major centers of ophthalmology such as Vienna, were quick to import and capitalize on European innovations. The founding of institutions devoted to eye diseases also began in Europe and spread to America. They were usually started by surgeons with a particular interest in eye diseases who opened up infirmaries and hospitals where they could treat those patients. Often services were offered gratis to the poor, which was the case with the first eye hospital opened in Vienna in 1786 by Georg Beer, and in The Wills Hospital established by a bequest from Quaker grocer James Wills in 1825 and opened in 1834. This was the third eye hospital in Philadelphia (the other two did not survive past 1830) and the seventh in America.

The exhibit, "Philadelphia Seen," includes almost every catalogued ophthalmological artifact in the museum, and divides them into the following subject areas: anatomy and pathology, examination and diagnosis, and surgery and medical treatment. In addition, there are two accessory exhibits. One features the key American texts discussed in Dr. Albert's 14 September talk displayed with memorabilia of the men associated with the works, and the other consists of the museum's extensive ophthalmoscope collection. Based on the exhibit "Philadelphia Seen," this paper looks at the ophthalmological instruments in the Mütter Museum which illustrate the historical development of this early and important medical specialty. Time and space permit only the briefest mention of some of the more interesting items in each category, but the names of the physicians associated as inventors or past-owners serve as a review of ophthalmology's progress as a specialty within the Philadelphia medical community.

Anatomy and Pathology

The best known Philadelphia contribution to eye anatomy was William Edmonds Horner's (1793–1853) description of the *tensor tarsi* muscle (Horner's muscle), which controls the passage of tears

Figure 1. Wax models of diseases and injuries of the eye, made at L'Hôpital St. Louis, Paris, and purchased in 1882.

from the conjunctival sac to the nose. On exhibit with the illustrated article from the 1824 Philadelphia *Journal of the Medical and Physical Sciences*[2] are Horner's tortoise shell watch chain and fob, and a mother-of-pearl and cowrie shell snuffbox. Mrs. Alfred R. Shands, whose late husband was a descendant of Dr. Horner, donated these and other personal mementoes; the museum also has Dr. Horner's microscope, one of the earliest used in Philadelphia.

The pathology exhibit includes microscopic preparations of the eye made by Viennese anatomist Joseph Hyrtl (1811–1894). There is also a visually arresting set of one hundred wax models of eye diseases made in the L'Hôpital St. Louis and purchased by the museum in 1882 from Tramond of Paris (see Fig. 1). Shown with these is a model of the eye used by Dr. Thorington (see Fig. 2).

2. William Edmonds Horner, "Description of a Small Muscle at the Internal Commissure of the Eyelids," *Philadelphia Journal of the Medical and Physical Sciences*, 1824, *8*: 70–80.

Figure 2. Wooden eye model used in office demonstrations by Dr. James Thorington (1858–1944).

Conditions represented are cataract, infection, inflammation, malignancy, trauma, and congenital abnormalities.

A more modern means of illustrating eye diseases is the B. Alexander Randall collection of lantern slides showing eye and ear pathology. These 393 slides which Dr. Randall gave to the museum in 1923 include one of Dr. William Fisher Norris demonstrating a conjunctival tumor in a patient, and the famous "Christ-like" portrait of Albrecht von Graefe.

Examination and Diagnosis

When Philadelphians were not the first to devise a certain technique or instrument, they were often the first in America to appreciate it. Thus Addinell Hewson, as editor of the first American edition of William Mackenzie's *Practical Treatise on the Diseases of the Eye* (1855)[3], added a chapter on the recently developed ophthalmoscope. It was the first to appear in any ophthalmological textbook. Later, in 1911, Allvar Gullstrand of Uppsala demonstrated his slit lamp, which revealed in the twentieth century almost as much new information about the interior of the eye as the ophthalmoscope

3. William Mackenzie, *Practical Treatise on the Diseases of the Eye* (Philadelphia: Blanchard and Lea, 1843).

had done in the nineteenth century. America's leading ophthalmologist of the time, Philadelphia's George E. de Schweinitz, was quick to bring the innovation to his own city. Today, this slit lamp, made by the Zeiss Works in Jena, may be seen in the Mütter Museum.

Philadelphia's contributions to optics and refraction have continued beyond Benjamin Franklin's invention of bifocals. Manufacturers such as Queen, McAllister and Zentmayer established the city's reputation for excellence in optical goods. Dr. William Thomson and Dr. William Fisher Norris, in the latter half of the nineteenth century, were pioneers in the systematic refraction of their patients' eyes. Their particular focus is reflected in the number of ophthalmoscopes and other refractive instruments they have left to the museum. "Skiascopy," or the use of the retinoscope for the objective analysis of refractive error, was established nationally by Dr. Edward Jackson of the Philadelphia Polyclinic. And the eminent neurologist and archetypal Victorian S. Weir Mitchell, working closely with ophthalmologists such as Thomson and Norris, was the first to relate "eyestrain" to headaches and functional nervous disorders. Mitchell also recognized that these afflictions could be relieved by proper refraction.

The museum has a number of trial cases, which contain all the necessary lenses and equipment for testing vision. Among them are sets used by Dr. Edward Jackson (see Fig. 3) and Dr. de Schweinitz. A recent addition is a case belonging to Professor Ernst Fuchs (1851–1930), who attracted many American ophthalmology students to Vienna in the late nineteenth century. This case was donated by the late Dr. Victor C. Rambo of Philadelphia, a medical missionary whose life was devoted to helping the curable blind in India.

Dr. James Thorington (1858–1944), father of College Fellow J. Monroe Thorington, devised a number of retinoscopic instruments which bear his name, including a mirror, an axonometer to determine the axes of the chief meridians in astigmatism, and a schematic eye used to study retinoscopy.

The spectacles are the most aesthetically pleasing part of the ophthalmological collection, with their gold and tortoise-shell frames and the brilliant blues and greens of the tinted lenses. The use of concave lenses for the nearsighted has been known since the sixteenth century; convex lenses for the farsighted date back to the twelfth century. Over the past seven hundred years these "visual aids" have been the object of a great deal of imagination and crea-

Figure 3. Trial case used by Dr. Edward Jackson in teaching skiascopy at the Polyclinic Hospital, before 1889.

tivity as people have tried new ways of keeping the lenses on the face and of making them attractive. Technological advances following the invention of the ophthalmoscope in 1850 put prescriptions for corrective lenses on a more scientific basis, but the interest in decorative frames has obviously continued to the present.

The earliest of the museum's 134 spectacles date only to the eighteenth century. A number of the oldest are Chinese and Japanese, some with elaborately carved tortoise shell frames and lenses of dark amber glass and quartz. Many of these Oriental spectacles were not corrective, but were worn to enhance the dignity of the wearer. A pair of spectacles signaled membership in a privileged, literate class, able to afford sight correction (see Fig. 4).

Until the late nineteenth century, ears were not routinely employed as anchors for glasses frames. The exhibit shows sidepieces designed to press against the temples or to be tied around the head. The nose enjoyed a hundred-year period of popularity as a supporter of lenses, beginning in the 1840s. Among the museum's pince-nez are a pair made for General John Pershing by Louis Borsch of Paris in 1928 and given to the Museum by Dr. Harold Scheie.

Benjamin Franklin successfully improvised bifocals in 1784 to relieve the necessity of changing glasses, but the modern era of

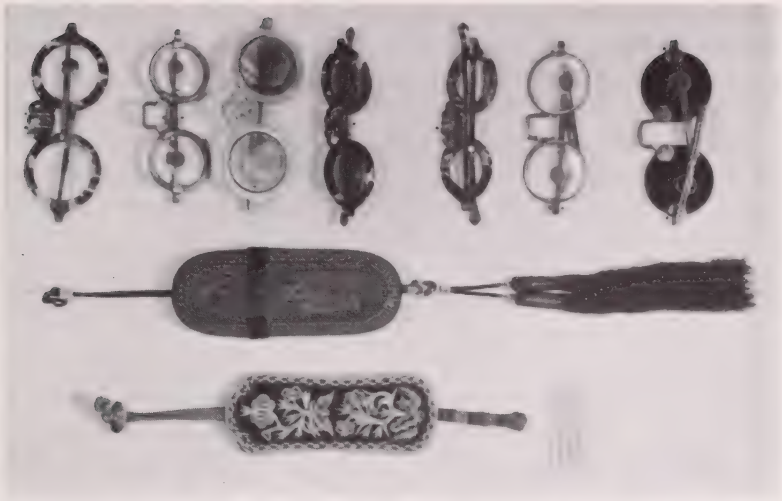

Figure 4. Eighteenth and Nineteenth Century oriental spectacles and cases; major donor Burton Chance, M.D.

bifocals began in 1884 when two forms were patented by B. M. Hanna: one made by cementing a wafer to the back of the distance lens and the other by inserting a round plug-like reading lens into the distance lens. On display are the first pair of cemented bifocals made on the prescription of Dr. George M. Gould by the Philadelphia opticians Wall and Ochs in 1888.

Colored lenses have a surprisingly long history. Many of the first lenses were made of colored quartz and beryl, and glass lenses in various shades have often been used to protect the eyes from fatigue. Of particular interest are a pair of green spectacles with hinged side lenses, used by John Greenleaf Whittier to rest his eyes while traveling.

Surgery and Medical Treatment

The earliest instruments specifically associated with eye surgery are delicate knives, scissors, and hooks used for treating cataracts, performing iridectomies for glaucoma, and creating artificial pupils in eyes occluded by smallpox. This work was done by the general surgeon until the late nineteenth century. Philip Syng Physick (1768–1837) is therefore known both as the Father of American Ophthalmology and of American Surgery. Physick's influence was spread through his lectures at the University of Pennsylvania's Med-

ical School, which he began in 1800. His teaching on eye diseases was published in his nephew John Syng Dorsey's *Elements of Surgery* in 1813, on view in the museum next to Physick's cataract instruments.[4] One of Physick's students was the Baltimorean George Frick, one of three candidates whom Dr. Daniel Albert proposes, in the article below, for the title of "America's First Ophthalmologist." Of an earlier date than Physick's instruments is an exquisite set of eye knives with mother-of-pearl handles, cased in a tortoiseshell box lined with white velvet. It belonged to Dr. William Hewson (1739–1774) of London, father of College founder Thomas Tickell Hewson, and was given to the museum by S. Weir Mitchell as his only donation of ophthalmic material. Equally elegant is an ivory-handled set from Charriere of Paris in a gold-stamped black leather case. This set was brought from France in the latter part of the nineteenth century by Dr. Thomas M. Drysdale, given by him to Dr. Thomas Fenton, passed from him to Dr. Burton Chance, and finally presented to the Mütter Museum. (The route by which objects come to the museum is often circuitous, but rarely does it so delightfully call to mind the old Chicago Cubs infield.) These two sets epitomize the beauty of surgical instruments before the advent of sterile operating procedures in the late nineteenth century. These hygienic standards made it necessary to abandon the non-sterilizable ebony and ivory handles and return to the all-metal instruments of earlier centuries.

A number of distinguished ophthalmic surgeons followed Physick, and the museum's collections include their instruments as well. Isaac Hays (1796–1879) was one of the most active in Philadelphia during the early nineteenth century. Among his many contributions to the field were the design of instruments, one of them being the Hays knife needle. Two of these are part of a set of cataract instruments owned by Dr. Hays. This particular set is currently on loan to the National Museum of American Jewish History in Philadelphia. Dr. Hays' fame in that context is derived from his relationship to the city's distinguished Gratz family. Hays began as a general surgeon, but devoted himself to the study and treatment of eye diseases after becoming a surgeon to the Pennsylvania Infirmary for Diseases of the Eye and Ear in 1822, an institution he helped to found and one in which he served as its first

4. John Syng Dorsey, *Elements of Surgery* (Philadelphia: E.R. Parker & Kimber & Conrad, 1813).

secretary. Following the close of the Infirmary in 1929, Hays was chosen by Dr. Joseph Parrish (1779–1840), the first President of the Board of Managers, to be on the first surgical staff at The Wills Hospital, when it opened in 1834.[5]

Dr. Parrish's son Isaac followed his father into the field of ophthalmic surgery and likewise served on the staff of The Wills Hospital. While none of his instruments found their way into our collections, he gave the College a far more valuable gift by starting its first museum in 1849. That collection was absorbed into Dr. Mütter's bequest when it was installed in the College in 1863.

Joseph Pancoast (1805–1882), associated with Jefferson and Pennsylvania Hospitals, practiced general surgery and also devised new techniques for operating on soft mixed cataracts, for strabismus, and for occlusion of the lacrimal duct. His instrument set includes, appropriately, Scarpa's knife needle for cataract, four lacrimal cannulae, three lacrimal styles, and a strabismus hook.

His son, William Henry Pancoast (1835–1897), had a general practice specializing in surgery, but did considerable eye work judging from the fact that the museum has two sets of his eye instruments. One of them was donated by Dr. Pancoast and Dr. Samuel D. Gross, both fellow members of the faculty at Jefferson for over twenty years.

Dr. D. Hayes Agnew (1818–1892) was the last general surgeon at the University of Pennsylvania who did any significant amount of eye work.[6] He even designed his own iridectomy knife. In the museum exhibit case next to a copy of his popular textbook on surgery is a cast of his left hand, possibly a tribute to his well-known ambidexterity.

William Fisher Norris (1839–1901), returning to Philadelphia from graduate ophthalmological studies in Vienna, became associated with both the University of Pennsylvania and Wills Eye Hospital and was extremely active in many ophthalmological organizations. His instrument set reflects his European and local orientation, with individual items purchased from Weiss of London, Luer of Paris, and Gemrig of Philadelphia. A look at the sets of instruments used by Philadelphia physicians in the nineteenth cen-

5. The museum does not have any ophthalmic memorabilia of Dr. Parrish, a prominent Quaker surgeon whose practice was exceeded only by Dr. Physick's, but it does have his brass office sign.

6. Albert and Scheie, *History of Ophthalmology*, p. 34.

tury reveals the wide variety of their contents. The variety comes in part from the common practice of "customizing" instrument sets by assembling the products of several different manufacturers, presumably because of the perceived superiority of the individual items. The contents of the sets also reveal changes in surgical techniques and the attendant changes in the instruments.

Couching, or simple displacement of the lens, was the common operation for cataract in the eighteenth and early nineteenth century. Cataracts were also treated by breaking them up with sharp-pointed needles and then allowing them to be absorbed or removed later with a curette. As expected, Dr. Hewson's eighteenth-century set includes four couching needles — one Saunder's, one Scarpa's, one Hey's, and one of unknown type. He also had four cornea knives of two popular patterns — Richter's (1770) and Wenzel's (1762).

Physick was skilled enough to extract the cataract, and used a Wenzel's knife for the incision. This is the knife which Dorsey illustrated in his textbook of surgery referred to above. Physick also used the triangular-bladed knife devised by the Viennese surgeon Georg Beer in 1800. This was one of the most durable designs, persisting throughout the nineteenth century. William Fisher Norris had four Beer's-type knives in his instrument set and three knives resembling Wenzel's. Despite the fact that suitable instruments for extraction existed from the time Jacques Daviel (1696–1762) introduced the technique in 1745, the alternate methods of cataract treatment were more widely practiced until the mid nineteenth century because they required less skill of the surgeon and had as good or better a success rate. Some doctors were as conservative in their choice of instruments as in their operating methods. Dr. Owen J. Wister (1825–1896) employed Benjamin Bell's pre-1822 cataract knife and an eighteenth-century style Wenzel's cornea knife. Dr. George E. de Schweinitz (1858–1938) was more modern in his surgical tastes, and his set contains nothing but Graefe's cataract knives in assorted sizes. Albrecht von Graefe had devised this narrow-bladed style as best suited for his particular technique of linear extraction, which he introduced in 1859 and modified in 1865 (see Fig. 5). They are still used today.

Ophthalmoscopes

Perhaps no collection better demonstrates the museum's range and

Figure 5. Cataract knives (from the top): Beer's, 1800; Beer's, 1800; unidentified; White's; von Graefe's, 1855; Jaeger's, 1873; Dixon's.

depth than its ophthalmoscopes. The museum owns over 62 individual instruments representing over 30 different models of the invention which transformed the entire practice of ophthalmology. There are examples of the very earliest as well as modern ophthalmoscopes, tracing the full chronology of the instrument's development. Multiple representations of the various models demonstrate the modifications which are not always described in trade catalogues or historical accounts, but which were obviously of significance to the makers and users of the individual instruments.

Hermann von Helmholtz's (1821–1894) 1851 ophthalmoscope was literally and figuratively a light shining in darkness (see Fig. 6). By a simple arrangement of silvered glass plates and lenses, he illuminated the interior of the eye, opening it up to systematic observation and allowing the correlation of its appearance with states of health and disease. It also made possible the accurate diagnosis of refractive errors, which could only be empirically corrected before.

Ophthalmoscopy employs either the direct or the indirect method. In the direct method of Helmholtz, the ophthalmoscope is held close to the eyes of both observer and observed. The indirect method, invented in 1852, uses a convex lens held in front of the patient's eye in addition to the ophthalmoscope held close to the

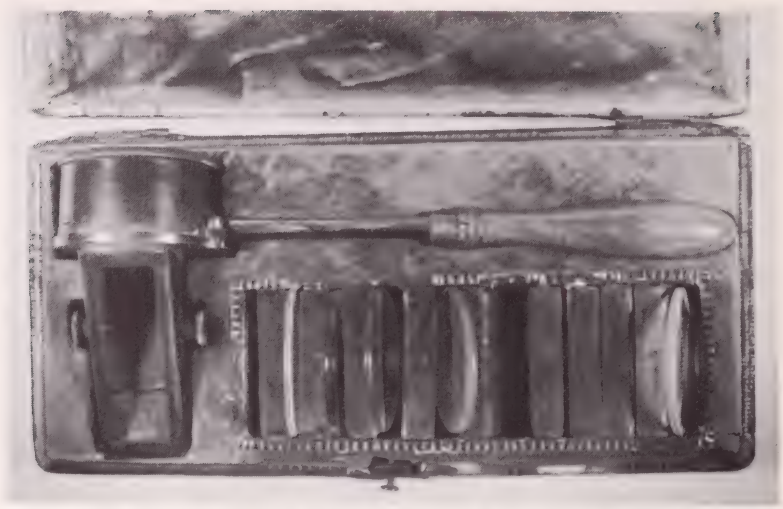

Figure 6. Helmholtz ophthalmoscope (modified), after 1852. This instrument belonged to Dr. Edward Jenner Coxe (1801–1882).

physician's eye. The indirect method reveals a larger part of the eye ground at a time, although the detail is less perfect, and it also permits the physician to keep a greater distance between himself and the patient, "a decided advantage in some clinical cases" as Dr. James Thorington observed in his book on refraction.[7] Lenses placed in front of the sight-hole are used to identify the nature and extent of refractive error in the eye under examination.

The principal differences among ophthalmoscopes are in the various ways of placing the lenses between physician and patient. After Helmholtz's created his original model, described in his 1851 *Beschreibung eines Augen-Spiegels*,[8] he added a pair of rotating discs, each containing four lenses of varying strengths. These discs, devised for Helmholtz by a Königsberg instrument-maker named Rekoss, are now standard parts of the modern handheld ophthalmoscope. However, other early ophthalmoscopes had removable lenses which were mounted in fixed or hinged clips. This was the type used by Carl Wilhelm Zehender of Rostock in 1854. The museum has an example of Zehender's second model, which be-

7. James Thorington, *Refraction and How to Refract* (Philadelphia: P. Blakiston's Son & Co., 1907), p. 99.

8. Hermann von Helmholtz, *Beschreibung eines Augen-Spiegels zur Untersuchung der Netzhaut im lebenden Auge* (Berlin: Pörstner, 1851).

Figure 7. Liebreich ophthalmoscope, second model, after 1860. This instrument was made by Luer in Paris.

longed to Dr. John B. Roberts, a charter member of the College's Section on Ophthalmology. One of the most popular of the removable lens type of instrument, judging from its longevity and widespread use, was based on Zehender's design. It was created by Richard Liebreich in 1855 and could still be found in American catalogues in 1915. The museum's collection of seven includes English, French, and German versions. Dr. Roberts owned a Liebreich, and another was taken from the body of a dead German medical officer on a battlefield in France during World War I (see Fig. 7).

One of the most popular of the disc-type ophthalmoscopes was the invention of Dr. Edward G. Loring of New York. In his first model of 1869, he substituted interchangeable discs for the fixed rotating discs of Rekoss. In subsequent modifications, Loring placed the lenses on a single disc and later added supplementary lenses on a movable quadrant. The museum has a total of thirteen Lorings in its collection, representing most of his major design changes. This collection includes the DeZeng scope, an electrified version of Loring's nineteen-lens top with the round tilting mirror, made by the DeZeng Standard Company of Philadelphia in 1904 (see Fig. 8).

As in biological evolution, certain lines of ophthalmoscopes mingled to produce hybrids, some of which were fertile enough to

Figure 8. DeZeng's electric ophthalmoscope, after 1904. Made by the DeZeng-Standard Co. of Philadelphia, this was basically a nineteen-lens Loring top with a round tilted mirror and a light bulb for illumination.

give rise to progeny of their own. In 1854 Eduard von Jaeger (1818–1884) combined the instruments of Helmholtz and Theodor Ruete (1810–1867) so that the instrument could be used for indirect examination. Jaeger then modified his own instrument by successively shortening the tube; the museum possesses three such modified Jaegers. The oldest, judging by the length of the tube, belonged to Dr. William Thomson. The next oldest belonged to Dr. Addinell Hewson.

Of the other descendants of the Rekoss disc-Loring line, the museum has a number of examples. One direct spin-off was Dr. Herman Knapp's 1876 innovation based on Loring's original model with three interchangeable discs. In 1887, Dr. Peter Dirck Keyser of Philadelphia provided an improved means of rotating the discs of the Knapp, and produced one of the smallest and lightest disc ophthalmoscopes made.

Louis De Wecker of Paris, in 1873, put all of Loring's lenses on a single disc which made the glasses inconveniently small. Even he acknowledged that the instrument was hard to use, as the lenses were difficult to center properly. The two former owners of the museum's De Wecker, which was made sometime after 1873, were apparently up to the challenge. The instrument first belonged to Dr.

Figure 9. Noyes Ophthalmoscope, after 1881; formerly belonged to Dr. William Thomson (1833–1907).

William Osler, who gave it to Dr. Guy Hinsdale, curator of the Mütter Museum during the 1884–1888 period that Osler was in Philadelphia.

Dr. Henry D. Noyes of New York created his ophthalmoscope in 1881 by connecting four discs and using a Loring mirror on the uppermost (see Fig. 9). He was a co-founder of the American Ophthalmological Society in 1864. His instrument obviously found favor with one of Philadelphia's leading ophthalmologists, Dr. William Thomson, whose two Noyes' are both in the museum. One of them also appears in his hand, in the portrait by Thomas Eakins which hangs in the College's Thomson Hall (see Fig. 10).

Three more Philadelphians contributed their own special touches to the basic Loring: Dr. L. Webster Fox made his modifications in 1885; Dr. John W. Croskey (who wrote a history of Blockley) in 1898; and Dr. Edward Jackson in 1887. Dr. Jackson, working at the Philadelphia Polyclinic and the Wills Hospital, was mainly responsible for popularizing retinoscopy in the United States, which provided more accurate refraction than the ophthalmoscope could achieve. His ophthalmoscope, known as the Polyclinic Ophthalmoscope, was distinctive for having the lenses mounted in two narrow slides.

Figure 10. Detail of portrait of Dr. Thomson by Thomas Eakins, 1907, showing the Noyes ophthalmoscope in his hand.

Conclusion

The record of ophthalmological activity in Philadelphia, as it is reflected in the Mütter Museum collections, is not complete but certainly reflects the major trends of the specialty and its principal practitioners. With these artifacts the physician shares his experience, and provides us with concrete evidence of the practice of his profession. This perspective on medicine at times supports the written history. It can also provide us with information that has never been recorded.

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The First American Ophthalmologist

DANIEL M. ALBERT

Introduction

In 1960, when I was a medical student at the University of Pennsylvania interested in ophthalmology, I became curious about the identity of the first American ophthalmologist. My professors had no idea who this person was, nor was the first American ophthalmologist mentioned in the usual textbooks on the history of medicine and ophthalmology. Consequently I spent a number of afternoons at the Library of the College of Physicians of Philadelphia researching this question. To my delight, I became convinced that the first American ophthalmologist was a graduate of the University of Pennsylvania School of Medicine, a man named George Frick. I wrote up my findings and submitted them to the *Archives of Ophthalmology* for publication in its recently initiated department: "Our Ophthalmic Heritage." Some weeks later I received a letter from the editor, Dr. David G. Cogan, stating that my article had been rejected and referring me to the appended letter of Charles Snyder, the section editor. Mr. Snyder informed me that although he himself was not yet certain who the first American ophthalmologist was, that individual certainly came from Boston. Now, 28 years later, older and wiser, in addition to proposing George Frick I will discuss John Homer Dix and Henry Willard Williams, two Bostonians.

George Frick

George Frick was born in Baltimore, Maryland in 1793. After obtaining a broad classical education, he entered the Medical Department of the University of Pennsylvania, where he received his medical degree in 1815. He was very much influenced by Phillip Syng Physick, a general surgeon with a strong interest in ophthalmology.[1]

Following his graduation from Penn, Frick continued his studies for four years in England and the continent. In 1817 he arrived

1. D.M. Albert and H.G. Scheie, *A History of Ophthalmology at the University of Pennsylvania* (Springfield, IL: Charles C. Thomas, 1965), pp. 5–17.

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in Vienna, where he attended the lectures and clinics of the great Georg Joseph Beer, the first fully trained physician and surgeon to devote himself entirely to the practice of ophthalmology. Frick's fellow students under Beer at that time included the founders of major ophthalmology centers throughout England and Europe.[2]

On his return to Baltimore, Frick was granted a license by the Medical and Chirurgical Faculty of Maryland. Frick took the bold step of limiting his practice to ophthalmology. And he became the first regularly trained American physician to devote himself solely to the treatment of diseases of the eye. About the year 1822 or 1823, Frick was appointed Surgeon at the Baltimore General Dispensary. Under Frick one of the Dispensary's four wards was "reserved for eye cases and instruction on ophthalmic surgery." Frick also began to deliver regular lectures on ophthalmic disease at the Dispensary and at the University of Maryland.[3]

In addition he contributed a series of articles to the American medical journals on cataract and its treatment, observations on conjunctivitis, and surgery for artificial pupil, reflecting Beer's teachings. He eventually decided to "select what is most valuable from [Professor Beer's] work" for a book, and add to it what he considered "most important from the experience and practice of others, together with such remarks as [my] own observations have supplied."[4] Thus in 1823, he published his *A Treatise on the Diseases of the Eye; including the Doctrines and Practice of the Most Eminent Modern Surgeons, and Particularly those of Professor Beer.* This was the first book on ophthalmology to be written by an American. The appearance of the London edition in 1826,[5] marked the end of Frick's publishing career.

Frick succeeded in establishing a large ophthalmic practice. But as time passed, he became afflicted by deafness, and by 1840 was described as almost totally deaf. Shortly thereafter he abandoned his practice of medicine and moved to Dresden, Germany. He re-

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2. E. Lesky, *The Vienna Medical School of the Nineteenth Century* (Baltimore: the Johns Hopkins Press, 1976), pp. 60–65.

3. E.F. Cordell, *Historical Sketches of the University of Maryland School of Medicine* (Baltimore: I. Friedenwald, 1891).

4. G. Frick, *A Treatise on the Diseases of the Eye: Including the Doctrines and Practice of the Most Eminent Modern Surgeons, and Particularly Those of Professor Beer* (Baltimore: Fielding Lucas, Jr., 1823), pp. ix–x.

5. G. Frick, *A Treatise on the Diseases of the Eye: Including the Doctrines and Practice of the Most Eminent Modern Surgeons, and Particularly Those of Professor Beer,* R. Welbank (ed.)(London: J. Anderson, 1826).

turned to America from time to time in order to visit relatives and friends. He never married.

Frick was described as a "shy, kind-hearted man, who everybody loved, upright and honorable in all his dealings."[6] Frick died in Dresden, Germany in 1870. When Frick began his career as a specialist in ophthalmology, he was almost alone in the field. There were no national societies, no special journals, no advanced programs of training and research. There were few men in America he could consult. For guidance and original thought, he had to turn to practitioners, clinics, and journals of Europe. It is to Frick's everlasting credit that he was able to recognize and utilize the best in European ophthalmology.

John Homer Dix

The person Charles Snyder eventually decided was the first American ophthalmologist was John Homer Dix.[7] Dix was born in Boston in 1811, approximately 20 years after Frick. He received his Bachelor of Arts degree from Harvard College in 1834, standing ninth in a class of 56 members. He then began the study of medicine under the preceptorship of Dr. John Jeffries, co-founder of the Massachusetts Eye and Ear Infirmary. He was awarded his M.D. degree in 1836 by Jefferson Medical College in Philadelphia.[8]

Regarding Dix's many priorities in American ophthalmology, Charles Snyder wrote the following:

> It is doubtful if any man in 19th century American ophthalmology has as many 'firsts' as John Homer Dix, and it is equally doubtful if any man took as much pride in them as he did. This is how Dix always like to see them listed.
>
> He was the first resident to be trained in ophthalmology and otology at the Massachusetts Eye and Ear Infirmary — 1834. He performed the first Dieffenbach operation for strabismus in America — 1841. He became the first U.S. doctor of high professional standing to become a full-time specialist in ophthalmology and otology — February 14, 1843. Within a

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6. T.H. Shastid, "George Frick" in C. Wood, ed. *The American Encyclopedia and Dictionary of Ophthalmology, vol. 7* (Chicago: Cleveland Press, 1921), pp. 5293–5294.

7. C. Snyder, "Our Ophthalmic Heritage: John Homer Dix," *Archives of Ophthalmology,* 1961, 66:760–761.

8. C. Snyder, *Massachusetts Eye and Ear Infirmary: Studies on Its History* (Boston: Massachusetts Eye and Ear Infirmary, 1984), p. 189.

> few days after Morton's demonstration of the anesthetic properties of ether, Dix performed the first eye operation using this agent — about November 1st, 1846. He owned the first ophthalmoscope imported into this country, and he, as an American ophthalmologist, wrote the first paper on the subject of the ophthalmoscope to appear in any U.S. medical publication — December 27, 1854.[9]

Dix left the Massachusetts Eye and Ear Infirmary in 1840 and subsequently was never affiliated with any other hospital. He had as his associates a number of outstanding young doctors who later became ophthalmologists in the New England area. His writings totalled 23 journal articles and three small textbooks. The latter consisted of his *A Treatise on Strabismus* (1841); *A Treatise on the Nature and Treatment of Morbid Sensibility of the Retina, or Weakness of Sight* (1849), and *The Ophthalmoscope and its Uses* (1856).

Dix was also a connoisseur of music, and an astute businessman. He built the Hotel Pelham at the corner of Tremont and Boylston Streets in Boston. This was the first family hotel in this country, and Dix lived in it for many years.[10] John Homer Dix died on the Isle of Shoals, New Hampshire, in 1884, at 72 years of age.

Charles Snyder states: "Dix never allowed himself to be shackled by the teachings of the past. A new idea was a goad to him; he could not rest until he tried it. Once having tried it, he had to write about it. For over 20 years his writings were among the best and most original to be found in American ophthalmic literature."[11]

Henry Willard Williams

As much of an authority as Charles Snyder is, we must defer to a greater authority on most things ophthalmologic — Frederick Verhöff. Verhöff stated that the first American ophthalmologist was Henry Willard Williams.[12] Williams was born in Boston in 1831,

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9. C. Snyder, "Our Ophthalmic Heritage: John Homer Dix," *Archives of Ophthalmology,* 1961, 66:760–761.

10. H.A. Kelly and W.L. Burrage, *Dictionary of American Medical Biography* (New York: D. Appleton and Co., 1928), p. 329

11. C. Snyder, "Our Ophthalmic Heritage: John Homer Dix," *Archives of Ophthalmology,* 1961, 66:760–761.

12. F.H. Verhöff, "American Ophthalmology During the Past Century," *Archives of Ophthalmology,* 1988, *39*:451–464.

ten years after Dix. He received his general education in the Latin schools at Boston and Salem. Because of ill health, however, he was obliged to give up his preparation for college and for seven years, Williams devoted himself to the mercantile business, working in counting rooms on Central Wharf in Boston. During these years he spent a considerable amount of time as secretary and publishing agent in the office of the Massachusetts Anti-Slavery Society.[13]

Recovering good health, he entered Harvard Medical School in 1844, at the age of 23, and began the study of medicine. At the end of his second year of medical school he went to Europe, and for three years, he studied medicine in Paris, Vienna, and London, devoting a considerable portion of his time to the study of diseases of the eye. He returned to Boston in 1849 and received his degree of Doctor of Medicine from Harvard Medical School in that year.[14]

Subsequent to this, Williams limited his medical practice to ophthalmology. In 1850 he delivered to a class of Harvard Medical students a course of clinical lectures concerning diseases of the eye, the first such lectures to be given in an American medical school. Williams continued to give these lectures at Harvard for the next 16 years, although he held no official appointment at the Medical School.[15]

Williams's first important appointment came in 1864, when he was chosen as the sole specialist among the 13-member staff of the newly-opened Boston City Hospital. This appointment came as a result of William's reputation as an ophthalmologist, a teacher, and, it has been conjectured, his political position in Boston. The appointment was made with the strong backing of Edward Reynolds and John Jeffries, the co-founder of the Massachusetts Eye and Ear Infirmary who were members of the Board of the Boston City Hospital. Williams was assigned his own beds, operating room, outpatient clinic, and a special intern, initially Edward Greeley Loring. The ophthalmology department thrived, and in a few years, accounted for nearly half the total cases of the hospital.

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13. T.H. Shastid, "George Frick" in C. Wood, (ed.), *The American Encyclopedia and Dictionary of Ophthalmology, vol. 18* (Chicago: Cleveland Press), pp. 14029–14031.

14. C. Snyder, *Massachusetts Eye and Ear Infirmary: Studies on Its History* (Boston: Massachusetts Eye and Ear Infirmary, 1984), pp. 178–179.

15. H.K. Beecher and M.D. Altschule, *Medicine at Harvard: The First 300 Years* (Hanover, NH: The University Press of New England, 1977), pp. 128–129.

As a result of Williams's private practice, his efforts at the Boston City Hospital, his private practice (which included Ralph Waldo Emerson for hysterical blindness and Emily Dickinson), and his contributions to the medical literature regarding ophthalmology, Williams became Boston's most esteemed ophthalmic practitioner and writer. Williams's publication in 1856 of a report in the *Boston Medical and Surgical Journal* entitled, "Iritis — Non-Mercurial Treatment," and two subsequent papers, each entitled, "On the Treatment of Iritis without Mercury," led to a marked change in the treatment of this disease, in which "mercurialization" had previously been considered the first requisite. It is interesting to note that the origin of the word "quack" was the excessive use of "quicksilver" or mercury by physicians. Thus Williams effectively prevented ophthalmologists from earning this title. About the same time Williams published his views on the physiological unfitness of women for the practice of medicine.

In 1865 Williams won the coveted Boylston Prize with his essay "Recent Advances in Ophthalmology." The essay, which brought American physicians abreast of the latest advances in ophthalmology, formed the seed from which Williams's two subsequent outstanding textbooks were derived.

In the 1870–1871 academic year, Harvard's new president, Charles W. Eliot, instituted a number of reforms in the Medical School, among which was the creation of separate departments for emerging specialties of medicine. A search for a Professor of Ophthalmology was instituted, and Williams was selected in 1871.[16]

Williams continued to contribute frequently to the journals during the course of his long career and Snyder notes: "The list of Williams's journal writings fill seven closely printed pages."[17] Far and away his most important article was his introduction of the corneal suture for use in cataract extraction.

Williams retained his position at the Boston City Hospital and Harvard Medical School until 1891, when he was 70 years old, and in poor health. On the occasion of his resignation he donated to Harvard University $25,000 in securities as a special fund for the maintenance of a Professorship in Ophthalmology, and thus the

16. Ibid.

17. C. Snyder, "The Single Suture of Henry Willard Williams," *Archives of Ophthalmology,* 1963, *70*:574–576.

Henry Willard Williams Chair came into being.[18] He continued his consulting practice until a few weeks before his death which occurred in 1895, at the age of 73 years.

Epilogue

Who then was the first American ophthalmologist? Three men are proposed. The three differ obviously in terms of temperament and talent. But perhaps the greatest factor limiting the contributions of each man was the time in which he lived. Frick, who I had the temerity originally to suggest deserves the appellation, attempted the practice of ophthalmology in an age when most others claiming to be oculists were itinerant quacks and spectacle vendors. Because of his education, background, and outstanding character, he was tolerated, but was not a role model and did not have significant impact on American Ophthalmology. A generation later, John Homer Dix practiced ophthalmology and otolaryngology, and had important impact as a clinician. In contrast to Frick he influenced younger physicians. Yet apart from the Massachusetts Eye and Ear Infirmary and a handful of similar eye hospitals, ophthalmology remained unrecognized as a specialty by other hospitals. Nor was ophthalmology recognized by any medical school. Williams, who was Verhöff's choice as America's first ophthalmologist, was a true force in the development of American ophthalmology. He brought about the acceptance of ophthalmology as a specialty in a leading general hospital, the Boston City Hospital, and established the Department of Ophthalmology at Harvard Medical School.

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18. C. Snyder, *Massachusetts Eye and Ear Infirmary: Studies on Its History* (Boston: Massachusetts Eye and Ear Infirmary, 1984), p. 184.

Ophthalmology Fellows: Members of the College of Physicians of Philadelphia Whose Speciality Is Ophthalmology

January, 1989

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Daniel M. Albert, M.D.
Charles M. Alexander, M.D.
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Review

LIEBENAU, JONATHAN. *Medical Science and Medical Industry: The Formation of the American Pharmaceutical Industry.* 207 pp. Baltimore: The Johns Hopkins University Press, 1987. Price $35.00.

Reviewed by JOHN M. O'DONNELL

When the author of this important work states in his preface that its readers will bring to the book their own prejudices, he is offering more than an epistemological truism. In the three decades since the Kefauver hearings, thumping the drug companies has been a perennial pastime of business ethicists, social scientists and cultural critics at both ends of the political spectrum. Jonathan Liebenau is uninterested in compiling a register of drug companies' commercial sins. Indeed, he considers it naive to expect that the pharmaceutical corporations should behave differently in the marketplace than any other politically and economically powerful industry. Eschewing moralism, Liebenau renders a history of this industry that contributes significantly to our understanding of the roots of the industry's power and society's various prejudices.

The story begins in Philadelphia shortly after the War of 1812, which politically and economically justified American apothecaries' declaration of independence from reliance on British chemical manufacturers. Producing standard remedies locally required little capital investment. Moreover, since Americans were notorious self-dosers, product demand (and profits) remained high. The ascendancy by the 1880s of large-scale pharmaceutical firms over proprietary producers, patent medicine manufacturers, and doctor-druggists follows the general pattern of nineteenth-century American economic development. But medical history, Liebenau correctly suggests, is as essential as economic history to an explanation of the emergence of the modern pharmaceutical industry.

In the middle third of the nineteenth century, therapeutic theory was becoming more conservative. Disenchantment with heroic therapy coupled with the rise in popularity of homeopathy prompted medical men to prescribe with increasing exactitude. Physicians encouraged the standardization of drug dosage and the establishment of pharmacopoeias. Eventually these trends would imply the standardization of drug preparation and manufacture by large firms capable of maintaining such standards.

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During that same period, doctors and pharmacists competed for patients. Each group was struggling to raise its historically low status by means of licensing and certification. The founding in 1821 of the Philadelphia College of Pharmacy, which every top pharmaceutical firm supported, helped to elevate the status of the pharmaceutical firms just as the establishment of medical school enhanced the prestige of doctors associated with them. The growth of academic specialization within schools of medicine paradoxically encouraged the collaboration of academic science and medical industry. The University of Pennsylvania's Horatio C. Wood, for example, is well known for his pioneering work in experimental pharmacology. Less recognized is his role as scientist and consultant for Merck and Company. The interpenetration of science, clinical medicine, and commerce was not without controversy. Physicians realized that reliance on company prescriptions jeopardized their claims to exclusive professional knowledge of therapeutics. Nevertheless, by the last decade of the century, physicians were routinely prescribing brand-name drugs produced by pharmaceutical houses in recognition of their superior quality.

American business in general assumed its modern form between 1880 and 1920, the chronological concentration of Liebenau's study. This transformation was particularly acute in the pharmaceutical industry due to the simultaneous rise of medical science. By 1895 the teaching of bacteriology and clinical pathology in Philadelphia was widespread, and the medical industry was quick to adjust to the new scientific vernacular. By the mid-1890s, the laboratory constituted the pharmaceutical company's centerpiece. It is important to note, however, that during this period bacteriological discoveries provided little in the way of therapeutic consequences. Indeed, the company laboratory was primarily devoted to the standardization of existing drugs. Liebenau illustrates effectively that the industry was at the time "science-associated" rather than "science-based." It appropriated for commercial and publicity advantages the image, not the reality, of biological science.

Ironically, the first demonstrable bacteriological therapeutic—diphtheria antitoxin—was produced by public health laboratories. The industry challenged government's entry into the manufacturing field as a dangerous, even illegal, intervention in commercial enterprise. Private firms hired away experts from municipal laboratories, assimilated their techniques as they accessed their markets, and lobbied to restrict governmental funding for public production of

serum. The success of this campaign led firms to extend the functions of the company laboratory. It would henceforth develop new biologicals, improve techniques of standardization, and present the image of the company as professionally altruistic and scientifically avant garde.

It was during this time that the industry began to articulate a code of pharmaceutical ethics that included pledges of scientific integrity, information sharing, and truth in advertising. This compelling ideology was transmitted to physicians through an ambitious program of direct scales contacts, printed pamphlets and instructional brochures, and even educational classes. This approach made the pharmaceutical industry central to the medical practitioner, for whom prescriptions had increasingly become the most effective way of exercising his therapeutic role. By choosing to promote certain drugs only to physicians and by controlling the scientific language of esoteric advertisements, companies were able to contrast effectively their methods with their less advanced patent medicine competitors. The coup de grace to that competition came during the Progressive Era when Mahlon Kline of Smith Kline and French successfully lobbied for provisions in the 1906 Pure Food and Drug Act which regulated the industry's standards in a way that effectively eliminated upstart competition.

Liebenau has provided an insightful account of the development of the American pharmaceutical industry that significantly shakes two historiographical prejudices. On the one hand, he provides a corrective to the foreshortened history of pharmaceutical manufacturing which tends to see the beginnings of growth and progress with the advent of psychopharmaceuticals and antibiotics after the Second World War. On the other hand, he brings a new perspective to the history of medicine by revealing the close and even symbiotic relationship among medicine, technology, and commerce. At the turn of the century, for example, the H.K. Mulford Company trained its sales force to present to doctor-consumers detailed scientific information about its products. What began essentially as a marketing strategy thus became a commonplace vehicle of therapeutic education.

Though recipient of less attention within the history of medicine, the pharmaceutical industry is at least as important as the hospital in the development of modern medicine. And since this is so, this work throws light on the historical importance of Philadelphia as a nationally prominent medical center. Likewise, it rein-

forces the role of the College of Physicians of Philadelphia (where the first calls for a national pharmacopoeia were voiced in 1787) as an important repository of and interpretive resource for that history. It is no coincidence that much of the fundamental research for this book was done at the College's Library, or that three of the four scholars acknowledged by the author are College Fellows. Liebenau's investigation is not the definitive study of the pharmaceutical industry; it is, however, the best place to start.

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New Books in the History of Medicine in the Historical Collections of the Library, July Through December 1988

THOMAS A. HORROCKS

Rima D. Apple, *Mothers & Medicine: A Social History of Infant Feeding* (University of Wisconsin, 1987).

John C. Burnham, *How Superstition Won and Science Lost: Popularizing Science and Health in the United States* (Rutgers University Press, 1987).

———, *Paths into American Culture: Psychology, Medicine, and Morals* (Temple University Press, 1988).

Susan E. Cayleff, *Wash and Be Healed: The Water-Cure Movement and Women's Health* (Temple University Press, 1987).

Timothy C. Jacobson, *Making Medical Doctors: Science and Medicine at Vanderbilt Since Flexner* (University of Alabama Press, 1987).

Mary Ann Jimenez, *Changing Faces of Madness: Early American Attitudes and Treatment of the Insane* (University Press of New England, 1987).

Clarence J. Karier, *Scientists of the Mind: Intellectual Founders of Modern Psychology* (University of Illinois Press, 1986).

Martin Kaufman (ed.), *Dictionary of American Nursing Biography* (Greenwood Press, 1988).

John Keown, *Abortion, Doctors and the Law: Some Aspects of the Legal Regulation of Abortion in England from 1803 to 1982* (Cambridge University Press, 1988).

Phillip A. Nicholls, *Homeopathy and the Medical Profession* (Croom Helm, 1988).

James T. Patterson, *The Dread Disease: Cancer and Modern American Culture* (Harvard University Press, 1987).

Ira Rutkow, *The History of Surgery in the United States 1775–1900, Volume I: Textbooks, Monographs, and Treatises* (Norman Publishing, 1988).

F.B. Smith, *The Retreat of Tuberculosis 1850–1950* (Croom Helm, 1988).

Arthur Wrobel (ed.), *Pseudo-Science and Society in Nineteenth-Century America* (The University Press of Kentucky, 1987).

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Samuel X Radbill, 1901–1987, a Personal Appreciation

FRED B. ROGERS

Dr. Samuel X Radbill was a skilled physician who exhibited many talents during his long lifetime. A convivial man of broad culture and scholarly attainments, he practiced medicine for over fifty years and did much else besides. Wise like Samuel, the seer of ancient Israel whose name he bore, Dr. Radbill is recalled fondly by all who knew him.

Samuel Radbill was a Philadelphian born and bred. After graduating from South Philadelphia High School he entered the University of Pennsylvania and received his M.D. degree in 1924. The following year was spent in a rotating internship at the Lancaster General Hospital, which brought a lasting affection for the locale, people and good food of the Pennsylvania Dutch. Returning to the Quaker City, he married Frances Hoffman, his high school sweetheart, in December 1925 and set up a general medical practice in the Eastwick section of Philadelphia. Later, Sam served a residency in pediatrics at the Children's Hospital of Philadelphia, became board-certified in that specialty (1938), and was elected a Fellow of the American Academy of Pediatrics. During World War II Radbill was with the U.S. Army Medical Corps, stationed in Texas; he left military service in 1946 as a Major. For many years Dr. Radbill was an attending physician at the Children's Hospital of Philadelphia and the Philadelphia General Hospital and taught pediatrics at the University of Pennsylvania Graduate School of Medicine. Sam was active in the Philadelphia County Medical Society, rising to the position of vice-president, and the Pennsylvania Medical Society, deliberating in its House of Delegates.

In 1943 Dr. Radbill was elected a Fellow of the College of Physicians of Philadelphia, where his interests in medical biography, history, and library science were outstanding. His many contributions to the College were chronicled in the July 1974 issue of its *Transactions & Studies*, which recorded events of a dinner and program held in March of that year in his honor to initiate an annual Radbill Lecture of the Section on Medical History. This included a biography of "Raddy" by his daughter, Gloria R. Hamilton, an appreciation by College librarian, Elliott H. Morse, as

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well as other tributes. A selected bibliography of the writings of Dr. Radbill from 1926–1973 was also included. Before his death Sam donated his professional correspondence, papers and photographs to the College Library. Witness to industry, these varied items cover over 25 shelf-feet in its Historical Collections. As honorary librarian, member of the Library Committee, and donor of books, Sam Radbill was an indispensable support for the College Collections.

In April 1988, on the occasion of the Thirteenth Radbill Lecture, the Section on Medical History distributed a memorial booklet of biographical material, numerous tributes and a completed bibliography. Mrs. Radbill, their two daughters and two grandsons were among the many who gathered then to recall Sam's life and work. His last talk at the College was a "Thursday Seminar" on the History of Children's Hospital for the Francis C. Wood Institute. Sam was a founder and devoted supporter of this new division of the College.

Personal memories well up from my forty-year friendship with Dr. Radbill. We met when I was a medical student and shared many activities and interests thereafter. I recall with pleasure our meeting at Leary's Book Store, visiting Bartram's Gardens with Sam as guide, participating in College committee and section doings and editing several of his articles for the *Transactions & Studies*, sitting on the Council of the American Association for the History of Medicine, and becoming charter members of the American Osler Society. Most enjoyable were afternoon visits to the gracious Radbill home on Welsh Terrace in Merion. Hours went fast while browsing and chatting in the upstairs library and each guest left with a gift, after the tasty repasts served by Frances. I was privileged to present the Radbills with several items for their remarkable collections of medical bookplates and pediatric implements. The latter are now on permanent display in the Samuel X Radbill Pediatric Historic Library at the Children's Hospital of Philadelphia. Radbill's final article, on the bookplates of the College, is included in this issue of *Transactions & Studies*.

Physician, historian, and friend, Doctor Radbill was a man of rare learning and virtue. Well endowed with each, he dispensed them liberally in his daily life.

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Rockefeller Foundation Fellowships in the Humanities

HARRY M. MARKS
ALAN M. KRAUT
BARBARA H. TRAISTER

In 1985 the Francis C. Wood Institute of the College of Physicians of Philadelphia became one of twelve sites established by the Rockefeller Foundation to advance scholarship in the humanities. This program is designed to aid scholars whose work advances understanding of the modern world through clarification of the past or direct assessment of the present. The grant provides scholarships for a year of research and writing at the College to six scholars whom the Institute has chosen on the basis of the quality of their work, and its utilization of the resources of the College. In this issue three of these Fellows, Harry M. Marks, Alan M. Kraut, and Barbara H. Traister present their reports. The other three Fellows will describe their research year in a subsequent issue.

—*Editor*

REPORT OF THE 1986–1987 ROCKEFELLER FOUNDATION HUMANITIES FELLOWSHIP RESIDENCY PROGRAM AT THE FRANCIS C. WOOD INSTITUTE — Harry M. Marks

The Idea of an Experiment

Experiment is "the only certain way of progress."[1] So wrote Torald Sollman, professor of pharmacology at Western Reserve University and chair of the American Medical Association's newly founded Council on Pharmacy and Chemistry, in 1908. For Sollman, as for many of his contemporaries, the laboratory experiment offered the surest, most effective way to penetrate the secrets of Nature. Like the seventeenth-century natural philosophers whose memory they

1. T. Sollman, *The Broader Aims of the Council on Pharmacy of the American Medical Association* (Chicago: American Medical Association, 1908), p. 47.

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invoked, biomedical scientists of the late nineteenth and early twentieth century celebrated the turn to experiment. From demonstrations in bacteriological laboratories of the "causes" of infectious disease to the study of human physiology in the carefully controlled environment of the metabolic ward, experiments provided the source of new truths about the workings of the body in disease and health.

In telling the story of modern medicine, historians have merely followed the lead of contemporaries. The identification of experimental knowledge with authoritative science is by now a familiar story, regardless of whether it is told with a Whiggish admiration for those who succeeded in wresting Nature's secrets from its bosom, or accompanied by ironic comment about the flummoxery by which medical scientists deceived the rest of us into taking them seriously.[2] But much as we now know about how experimental knowledge was prized, we know relatively little about what contemporaries meant by an experiment, about what constituted an adequate or inadequate experiment in specific contexts, or about the relation between experimental theory and practice in the various biomedical disciplines.

Research Activity During the Grant Period

The working correspondence of biomedical scientists contains a wealth of material about how they construed, practiced and came to formulate judgments about experiments. Historians have generally used such sources to explore the biography of individual scientists or to examine the history of specific scientific problems, e.g. the etiology of yellow fever or the theory of cellular immunity. But scientists' correspondence may be read with a different purpose in mind: to understand how scientists from varying backgrounds judged the value of new experimental results, to look at the standards and assumptions they brought to bear in designing and interpreting experimental work, and to examine how differences of opinion regarding the validity and the value of new experimental claims were handled.

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2. For examples of the epic and ironic genres, respectively, see S. and J.T. Flexner, *William Henry Welch and the Heroic Age of American Medicine* (New York: Dover Publications, 1966), and B. Latour, "Give Me a Laboratory and I Will Raise the World," in K.D. Knorr-Cetina and M. Mulkay, (eds.), *Science Observed: Perspectives on the Social Study of Science* (Beverly Hills: Sage Publications, 1983), pp. 141-170.

My year as a Rockefeller Fellow was spent examining the correspondence of a wide variety of laboratory scientists, intended to complement previously completed research on experimentation in clinical medicine. My reading focused on the activities of researchers in physiology, pathology, pharmacology, biochemistry and immunology.

Philadelphia proves to be a particularly rich locale for studying the history of twentieth-century experimental practice. At the College of Physicians of Philadelphia, the papers of E.B. Krumbhaar, pathologist and editor of the *American Journal of Medical Sciences,* demonstrated the value of journal editorial correspondence for looking at the ways in which scientists assess new experimental work, while J. Harold Austin's correspondence illuminates how statistical ideas of experimental design and analysis entered clinical investigation. At the University of Pennsylvania archives, the papers of A.N. Richards and of Carl F. Schmidt provided entree to two generations of research pharmacologists and their work. The most extensive and wide ranging collections for studying the history of biomedical experimentation were at the American Philosophical Society (APS). Extensive correspondence from researchers associated with the Rockefeller Institution for Medical Research are at the core of the APS' holdings in twentieth-century medicine. Holdings consulted include the papers of Rufus Cole and Peyton Rous, which incorporate the editorial correspondence of the *Journal of Clinical Investigation* and the *Journal of Experimental Medicine,* respectively, the papers of the virologists Thomas Rivers and Florence Seibert, and the papers of Rockefeller associates O.H. Robertson and James Murphy. Also useful were several APS collections from scientists unaffiliated with the Rockefeller Institute, including the papers of the chemist William Mansfield Clark and the biometrician Raymond Pearl, both associated with Johns Hopkins, and those of Joseph Stokes, active in pediatrics and clinical immunology.

Conclusion

In planning, executing and judging new experimental work, biomedical researchers were dependent on "local knowledge" of the techniques and materials employed in a given series of

experiments.[3] The "knowledge" acquired from working with a particular organism, species, cell line or culture did not translate — necessarily or directly — to similar organisms, species, cell lines or cultures. Knowledge of experimental techniques — the preparation of specimens or substances — and familiarity with experimental apparatus used to produce and measure experimental results was similarly restricted and specific. The plausibility of experimental findings accordingly depended on prior acquaintance with the experimental protocols and apparatus. Validation of novel findings depended on the ability and willingness of investigators to participate in what I would term a "gift culture": the voluntary exchange of biological materials, technical advice and technical workers which provided scientists with a common basis of reference and experience.[4] Historians of science have generally focused attention on the role of disciplines and research schools in shaping the path and progress of scientific research. A study of "local knowledge" suggests the existence of much smaller groups working with materials and experimental systems similar enough to give them confidence (or informed reservations) about the work of their peers. "Local knowledge" of materials, technical practices and evidentiary standards was part of the background "noise" which accompanied the more publicized disputes, celebrated successes and less celebrated failures about which we write. For many subjects in the history of twentieth-century medical science, we know very little of what this background sounded like to those who worked in it.

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3. The themes and findings of this work were more fully developed in "Local Knowledge: Experimental Communities and Experimental Practices, 1918–1950," a paper prepared for the Conference on Twentieth-Century Health Sciences, University of California, San Francisco, 23 May to 24 May 1988.

4. The notion of a "gift culture," establishing reciprocal obligations among participants, comes from M. Mauss' *The Gift* (New York: W.W. Norton, 1967). Its role in science is implicit in Merton's notion of communism as a scientific norm and was developed explicitly and at length by one of Merton's students, Patricia Woolf. See R.K. Merton, "The Normative Structure of Science," in his *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago: University of Chicago Press, 1973), pp. 273–275; P. Woolf, "The Second Messenger: Informal Communication in Cyclic AMP Research," *Minerva,* 1975, *13*:349–372.

REPORT OF THE 1987–1988 ROCKEFELLER FOUNDATION HUMANITIES FELLOWSHIP RESIDENCY PROGRAM AT THE FRANCIS C. WOOD INSTITUTE—Alan M. Kraut

Silent Travellers: Germs, Genes, and the "Immigrant Menace," 1880–1940

During my year in residence at the Wood Institute, I pursued research on my project, "Silent Travelers: Germs, Genes, and the 'Immigrant Menace,' 1880–1940." The project focuses on biomedical issues as they affected the lives and legal status of immigrants arriving in the United States during the late nineteenth and early twentieth centuries. It is an analysis of how the immigrants' admission to the United States and their lives after arrival were conditioned by matters of genetic suitability, health and hygiene as defined by Americans, by their government, and especially by the professional medical community in the United States. It will also treat immigrants' perceptions of their impact upon the health and vitality of the American population. I expect to complete my research in spring 1989 and submit a completed manuscript for publication in June 1990.

The "huddled masses" coming largely from southern and eastern Europe and Asia often seemed a "health menace" to the native born. The book that will result from my study of immigration focuses on the tug of war over that perception—the self-proclaimed advocates of scientific medicine and disinterested bureaucratic public health policy versus the new arrivals, different in appearance and immunities, steeped in traditional ethnic and religious values. This struggle began in the late nineteenth century.

Always the main focus will be the individual immigrant. In the end, it was the foreigner who was examined upon arrival by U.S. Public Health Service physicians and either admitted or rejected; it was the foreigner who like-wise lived in the filthy, stifling tenement, who worked in the sweatshop, who fell ill and required care, who accepted the physician's medicine or resorted to old world nostrums, who trusted only doctors fluent in his or her native tongue, and who sought cure in a denominational hospital that cared for the soul as well as the body.

During the peak period of immigration and, as the result of their confrontation with these newcomers, Progressive reformers

armed with their own cultural perceptions and the latest advances in medical knowledge and technology revised their definitions of order and rational public health policy. Immigrants anxious to live and work in good health, but equally determined to preserve their culture and personal options, could only temporarily and partially resist the cultural imperialism that moved the settlement house worker's helpful hand or determined the physician's prescription. Some groups resisted more successfully than others, but always the result was a negotiated reconciliation of modern medical practice and cherished cultural traditions. Doctors and medical scientists, dimly aware that diseases and diagnoses were not value-free, found in the newcomers and their unfortunate circumstances a laboratory complete with subjects and specimens. The immigrants challenged the doctors' epidemiological understanding and profoundly affected their definitions of health care.

The feud between public health reformers and immigrants, a long neglected chapter in the historian of medicine's chronicle of public health policy and the immigration historian's saga of America's peopling, has yet a larger dimension. It is a microcosm of the struggle to reconcile sacred and secular in American culture, a conflict perennially renewed by the arrival of people from traditional cultures in a country that after the Civil War substituted science for spiritual salvation, individual for group, and health for spiritual grace as cultural priorities. As he stepped ashore, each newcomer by his very past dared American culture to demonstrate that better living was gained through chemistry and not through the observance of the customs and rituals of his native land.

Most immigrants in the period covered by this study were urban dwellers after arrival. In great ports such as New York, Philadelphia, and San Francisco newcomers landed and often stayed. Philadelphia therefore, provided the research site for this study during the past year; others will be New York, Chicago, and San Francisco.

Research Activities During Grant Period

After my arrival at the Wood Institute, I spent the autumn engaged in reading secondary sources and exploring the rich pamphlet collections of the library of the College of Physicians of Philadelphia. I attended weekly seminars sponsored by the Wood Institute.

I gave presentations at the Wood Institute Seminar and in Baltimore at the Institute for the History of Medicine at the Johns Hopkins University Medical School. In December, I presented a paper entitled "Silent Travelers: Germs, Genes, and American Efficiency, 1890–1924" at the American Historical Association Convention in Washington. A revised version of that paper has been accepted for publication by *Social Science History* and will appear in volume 14 of that journal in the winter issue of 1988/1989. My College Night Lecture in March, 1989 "Healers and Strangers: Immigrant Attitudes Toward the Physician in America — A Relationship in Historical Perspective" was based on this research.

In the spring I spoke in the History Department Colloquia Series at the Catholic University of America. I delivered a paper on "Health and Immigration" at a symposium entitled "From Restriction to Amnesty" at Rhode Island College.

During the winter and spring, I pursued archival research at the various libraries and repositories throughout Philadelphia. Among the archival collections that I consulted during the past year were:

American Philosophical Society: Franz Boas papers; Eugenics Society papers and publications; papers of the New York City Board of Health on the 1916 Polio Epidemic in the Simon Flexner papers.

Albert Einstein Hospital: Annual reports

University of Pennsylvania School of Nursing: Visiting Nurse Service of Philadelphia papers.

Balch Institute for Ethnic Studies: Leonard Covello papers; United Jewish Welfare Board papers; Catholic Slovak Men's Association papers.

Urban Archives at Temple University: Reed Settlement House papers; various newspapers and urban maps.

Municipal Archives of Philadelphia (annex): Mayor's reports, including Board of Health reports, 1890–1924.

During the year, I also used the William Williams papers (Commissioner of Immigration in Port of New York, 1902–1905, 1909–1914) at the New York Public Library. In Ithaca, New York I consulted the ILGWU papers (International Ladies' Garment Workers Union), the Amalgamated Clothing Workers Union pa-

pers, and the Jacob Potofsky papers at the New York School of Industrial and Labor Relations Library at Cornell.

In addition to the manuscript resources, I benefitted enormously from my contact with scholars in the Philadelphia area. I would like to thank in particular: Joseph Anderson, Barbara Bates, Janet Golden, Elizabeth Horrocks, Thomas Horrocks, Diana Long, Joan Lynaugh, Frederic Miller, Charles Rosenberg, Paul Rozin, Barbara Traister.

I am most grateful to the Rockefeller Foundation and the College of Physicians for their support.

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REPORT OF THE 1987–1988 ROCKEFELLER FOUNDATION HUMANITIES FELLOWSHIP RESIDENCY PROGRAM AT THE FRANCIS C. WOOD INSTITUTE — Barbara H. Traister

A Window on Elizabethan London: Simon Forman

The Rockefeller Foundation Fellowship supported my work on a social biography of a late sixteenth-century English astrological physician named Simon Forman. Simon Forman is worth examining not so much for his own achievements, though he was an interesting and even eccentric character, as for the detailed records of his life and medical practice, which he left in manuscript. Such documentation about daily life is rare in the records of Tudor England from a man of Forman's class, a poor apprentice who rose to become a fairly wealthy physician. In addition, the most extensive extant records of sixteenth-century English medical practice are to be found in Forman's medical case books.

Research Activity During The Grant Period

When I came to the College of Physicians in the fall of 1987, I had completed my primary research on Forman himself. I planned to study the history of sixteenth-century medicine as necessary background for the chapters on Forman's medical practice and I planned to write much of the book.

The timetable outlined in my fellowship application shifted to accommodate a series of talks which I gave to various scholarly groups during the year. Each talk became the backbone of a chapter in the book. Early in the fall, I gave an overview of my project and of its medical ramifications to the History of Medicine Seminar of the Wood Institute. In preparation for this talk, I studied the Galenic and Paracelsian medical theories of the period in order to place Forman within contemporary medical practice.

In October I spoke before the Renaissance Seminar and Friends of the Library at the University of Pennsylvania on magical and occult aspects of Forman's practice. I focused on the astrological underpinnings of medical theory in Forman time and on the influence of alchemy on the development of chemical medicines, then just beginning under the influence of Paracelsus, to supplement herbal remedies in use since classical times.

In November, at a seminar for the History and Sociology of Science Department at the University of Pennsylvania, I discussed the details of Forman's practice as recorded in his medical casebooks. For this talk I studied other casebooks and medical records of the period to see how they compared with Forman's, and I investigated the politics of the sixteenth-century medical profession in England. Forman was refused a medical license by the Royal College of Physicians, though he was later granted a license to practice by Cambridge University. His London practice continued to grow despite his repeated punishment by the Royal College. To understand such developments in Forman's career required study of the rapid professionalization of medicine in England at a time when almost no advances in medical technique or knowledge occurred.

As an outgrowth of this study, I abandoned Forman briefly to write "Minister to a Mind Diseased: Physicians in Shakespearian drama," a paper presented at the Northeast Modern Language Society of America meeting in Providence in March. This paper argues that the growing professionalism of physicians in the late sixteenth-century is reflected in their changing representation on Shakespeare's stage.

A similar detour was a second literary paper, "Body Language in *Philaster* and *Cymbeline*," presented at the annual meeting of the Shakespeare Association of America in Boston in April. Study of Renaissance views of the body and especially of bleeding as a pro-

phylactic measure indicates that these notions should inform our readings of both plays.

These literary papers look forward to the project which I intended to begin once my work on Forman is complete and which emerged from this year's research. I hope to write a study of how medical practice and theory were incorporated in the literature of the English Renaissance, often in ways not readily accessible to the modern reader.

In addition, this series of papers afforded me the occasion to write, in preliminary form, three chapters of the Forman study. I completed as well the long first chapter of the Forman book, a chapter discussing Forman's own versions of his life and why he fought so hard to succeed in his medical practice, despite the roadblocks which the Royal College persistently threw in his path.

In the spring I completed what I had originally planned to make my first task of the fellowship year, editing a Forman treatise on gynecology. With an introduction and extensive footnotes, this treatise is now being considered for publication by a journal of medical history.

Conclusion

My focus thus far has been on what I actually wrote, pages of text which can be weighed and counted. Everything that I learned during my Fellowship year cannot be so easily measured. The opportunity to do extensive reading in Renaissance medicine added considerably to the scope of the book on which I am now working. What I had originally expected to be one or two chapters of the Forman study has now grown to at least four chapters. In addition, as mentioned above, my study has suggested the usefulness of a broader study of medicine in relation to the literature of the period. The library at the College of Physicians enabled me to read almost anything which my bibliographic inquiries turned up and to get at such materials rapidly. Though not particularly noted for its collection of Renaissance materials, the library contains a remarkably high percentage of the sixteenth-and seventeenth-century texts I required and almost all of the secondary material as well. Library staff were unfailingly agreeable and helpful.

I had anticipated this bibliographical strength and helpfulness but was surprised by an unexpected form of assistance. The seminars in the history of medicine run by the Wood Institute and the

conferences held at the College during the year put me in contact with a number of people who assisted my work (sometimes unbeknownst to them, I am sure). These meetings helped me to grasp the vocabulary of medical history and of clinical practice, and the approaches to the materials of medical history taken by people trained in disciplines other than my own were also enormously helpful in teaching me to ask new questions of the Forman material.

More than simply offering me an opportunity to acquire methodology and vocabulary, however, the College of Physicians also brought in scholars either directly concerned with material similar to mine or who could, and did, suggest other contacts whose interests intersected with mine. Ann Carmichael, Michael MacDonald, and Bert Hansen are just three examples of such helpful contacts who came to speak at the College during the year. In addition, of course, the regular members of the Wood Institute History of Medicine seminar provided continuing intellectual stimulation and often helpful suggestions.

My interest in the history of medicine has grown enormously during the tenure of my fellowship. From an area which I needed to know to complete a specific project, it has developed into a subject which I want to continue to study and to write about. As one means of maintaining contact with people in the field, I have accepted a humanities fellowship at the Medical College of Pennsylvania for 1988–1989. I will teach a course in medicine and literature at the Medical College of Pennsylvania and continue my research in Renaissance medicine.

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Rudolf Hirsch, ed., *A Catalogue of the Manuscripts and Archives of the Library of the College of Physicians of Philadelphia,* University of Pennsylvania Press, 1983.

Russell C. Maulitz and Diana E. Long, eds., *Grand Rounds: 100 Years of Internal Medicine,* University of Pennsylvania Press, 1988.

Russell C. Maulitz, ed., *Unnatural Causes: The Three Leading Causes of Death in America,* Rutgers University Press, 1989.

* * * * *

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When sending manuscripts as hard copy, authors should submit two copies, typed on one side of 8½ by 11 inch paper; all material, including quotations and footnotes, should be double-spaced. A short summary of the paper and brief biography of the author should also be included. *Transactions & Studies* prefers to receive articles on 5¼ inch computer disk, preferably in "Word Perfect," although other languages are acceptable. Articles on disk should have the notes, in footnote form, listed at the end. A complete set of instructions will be sent to authors.

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Records office, School of Medicine, University of Pennsylvania

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HENRY HARTSHORNE, M.D. (1823–1897) was Professor of Hygiene and Diseases of Children at the Woman's Medical College of Pennsylvania, and great-uncle to Emily Hartshorne Mudd. The Historical Collections of the College of Physicians has an extensive,

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Cabinet of the College. A Fellow of the College of Physicans of Philadelphia, Dr. Nowell's work has been primarily in cancer research.

ROBERT S. PRESSMAN, M.D. was President of the College of Physicians of Philadelphia, 1984–1986, and the Philadelphia County Medical Society, from whom he received the Strittmatter Award in 1984. He was Chair of the Board of Trustees of the Pennsylvania Medical Society from 1982–1985. A Fellow of the College of Physicans of Philadelphia, Dr. Pressman received the Distinguished Internist Award from the American Society for Internal Medicine in 1985.

* * * * * * * * * * *

Errata to the March 1989 issue of *Transactions & Studies of the College of Physicians of Philadelphia*:

Dr. Karl H. Holubar was incorrectly identified as Chair of the Department of Dermatology (First Clinic) at the University of Vienna. He is Professor of Dermatology in that Department.

Dr. Daniel M. Albert was incorrectly identified as David G. Coben Professor of Ophthalmology. He is David G. Cogan Professor of Ophthalmology.

Editorial

When Mildred Cohn, Professor of Biophysics and Biochemistry at the School of Medicine of the University of Pennsylvania, received the Distinguished Service Award of the College in 1987, she joined the many women who have played a significant role in the history of medicine and in the history of the College of Physicians of Philadelphia.

This issue of the *Transactions & Studies of the College of Physicians of Philadelphia* celebrates and examines those roles with a special section on Women and Medicine. We begin in 1872, with excerpts from a pamphlet in the Historical Collections of the College of Physicians of Philadelphia by Henry Hartshorne, "Valedictory Address to the Twentieth Graduating Class of the Woman's Medical College of Pennsylvania." Prescient in its reference to the potential threat to women's freedoms from the "Chief Justice," this address is also modern in its recognition that women represent both a problem and an opportunity for the profession of medicine.

The article by Nancy Juergens, Diana E. Long, and Steven C. Martin on the College exhibit, " 'Looking Forward': An Exhibit on Women and Medicine at the College of Physicians of Philadelphia," continues our historic exploration with a focus on the women of the College and the materials in the College collections. Steven C. Martin reports on the Measey Foundation workshop at the College in 1987–1988 that provided the exhibit with information on the current dilemmas of women in medicine. Finally, celebrating one of the College's most prominent and supportive fellows who was recently its secretary, we include the remarks of Emily H. Mudd, Ph.D., on the occasion of the American Civil Liberties Foundation of Pennsylvania banquet honoring her work on behalf of family planning and reproductive freedom. This work is emblematic of a historic concern on the part of women to combine social service with medical practice. Dr. Mudd, a great-niece of Henry Hartshorne, selected his work for this issue because of its contemporary interest.

Two other papers in this issue, given at Wood Institute History Seminars in 1987 and 1983, remind us how provocative and varied the roles of women in medicine have been. Virginia A. Metaxas Quiroga describes an early lying-in hospital founded by women on feminist and upper class values that were soon modified by the needs

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of the women who were patients. Audrey B. Davis looks at the work and continuing dilemmas of anesthesia, in which women, as nurses, have established a professional specialty along side of medicine's anesthesiology. All of these changes, Claire M. Fagin points out in her review of Susan Reverby's history of nursing, have been hard won by women "looking forward" to equal treatment as health care providers and as citizens.

Memoirs of a Bookseller

RICHARD W. FOSTER

Bookselling, it is said, will not make you rich but it will certainly give you a rich life. Indeed, I find it to be so for I have enjoyed every minute of my life in bookselling.

How did I find my way to medical books?

My first job was with a publishing company, founded in 1785, steeped in the literary and medical past to such a degree that if you had the least interest in American History (and I had such an interest), you could not avoid this sense of the past which seemed to permeate the place.

And so I became infected with a fascination for medical books. Because medical records in the form of Sumerian tablets dated at least 1800 years before Christ, I flatter myself that I am associated with an activity that is four thousand years old.

So when I left publishing for bookselling, it was natural that I should have in my bookstore a section on medical history including out-of-print, rare, and what might be called unusual books.

It is, for me, a marvelous sensation to have in my hand books which have changed the way people think and therefore the way they act. But I am not a collector of books. My joy is to have books, new or old, come my way, reside with me for a longer or shorter time and then find a home elsewhere, permanent or temporary.

Is that the essence of bookselling? This eclecticism enables one to roam freely among untold thousands of books published in the last five hundred years. Permit me an analogy. Some fifty years ago I was deputized to take a California botanist to Chester County here in Pennsylvania, the birth place of American botany, associated with John Bartram, William Darlington and others. My California visitor's great interest was sedges and for many hours we walked, he bent almost double as he peered among the grasses and weeds. Meanwhile I gazed at the beautiful scenes of Chester County. It is something like this with books: I offer a potpourri, a kind of smorgasbord of medical books. Many of those who come to the bookstore are like my botanical friend, delighted with the smorgasbord but concentrated on one subject.

Bookselling has an element of book collecting. I buy a book not only because it is probably salable, but because I feel a kind of

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cupidity, the desire to own the actual acquisition as a thing in itself. It is like the first kiss—the others that follow are never the same. I may have the book for some years, occasionally take it from the shelf and fondle it, and then see it depart with poignant regret.

Bookselling has a kind of prestige to it. I do not know why this is so but perhaps it is because we deal essentially in wisdom, knowledge, and ideas. Booksellers are not like librarians who are preservers of these things, rather they are distributors. The joy of a bookstore is its kaleidoscopic character, changing from day to day, rich in titles in your own particular field this week, poor the next. Perhaps because we purvey knowledge and ideas, booksellers have a kind of patina or veneer of scholarship. Unlike auction houses where the price of everything is known but not its value, specialty bookstores are supposed to know both price and value.

Book collectors and booksellers have, or ought to have, one paramount characteristic in common: a love of books. There is an instant rapport between the two, and this is a source of singular pleasure. It is, so to speak, a fringe benefit of bookselling.

Books come to me from a variety of sources. Perhaps you would enjoy an anecdote or two from my forty or more years of bookbuying and selling. I recall with pleasure a delightful incident in one of those barns of New Hampshire stuffed with odds and ends. A stout, no-nonsense woman, well past the bloom of youth was at a dirty old desk. I asked if there were books: "over there" was her curt reply. I rummaged through a dirty (soiled, that is, not pornographic) pile of books. I finally found a medical book and asked its price; "it's marked in the back" she snapped. I looked and beheld a penciled notation of $8.50. "It says eight dollars and fifty cents," I said. "How did you arrive at that price?" "My husband marks them books," she replied. "And he said some damned fool will give us eight dollars and fifty cents for this book." "You have just found him," said I, handing her the cash. With no comment, she slammed the money into a drawer. The sale was complete. Great place, New Hampshire—on the whole I'd rather be in Philadelphia.

A book's age does not necessarily make it rare or valuable. There was the case of a young man who came to the bookstore with a book in a brown bag. He asked for an appraisal. When I told him I would charge a fee for this he lost his temper. I wanted to ask him if he expected free advice from a physician, but I said, "why don't you ask me what I will offer you for it?" Slowly he extracted the book from the brown bag. "It has no commercial

value," I informed him. He cried, "You are cheating me! This book was published in Philadelphia in 1840." I tried to explain that age was no absolute criterion, but he went away shouting "You cheated me!"

One can have frustrating experiences in acquiring books. A few years ago a woman telephoned that she had a number of "old" medical books which she wanted to sell. Now, old is a relative term. After all, to someone who is eighty-one, the 1920's are yesterday and the 1890's are not that so far off. I have often heard of books published in 1950 as old. I asked her what she meant by "old." She replied, "They were published in the eighteenth century." At this I pricked up my ears. It turned out she lived in Paradise, Pennsylvania which is on the old Main Line of the Pennsylvania Railroad in Lancaster County. One day, off I went to the Dutch country. When I found the house my heart sank -- it was no eighteenth-century farmhouse but a twentieth-century split level. When I was shown the books, lo! they were published in the 1890's. That dear lady thought the 1800's were the eighteenth century.

I have had some remarkable books pass through my bookstore. Among the incomparable was a first edition of Vesalius. What a beautiful object — a work of art as well as a work of science. This copy, by the way, was purchased by a North Carolinian who some years later gave it to Jefferson Medical College where it has found a permanent home.

Another favorite was the broadside with printed instructions for the Great Plague of London, 1665. It stirred the imagination to hold this sheet of paper so intimately associated with that time of terror and despair.

There is in the library of the College of Physicians an unusual collection of Galen. Many years ago, in the days of Librarian McDaniel, I brought a number of editions of Galen. Included in this lot was a particularly beautiful edition, a large octavo. We searched for locations of this edition and discovered that only two other copies were known, one in the Bibliotheque Nationale and one in Germany. None at the British Museum, or the National Library of Medicine. Perhaps not a significant book but fun nevertheless.

It is curious how one can remember the story of particular books. I went to a band box of a house in Northeast Philadelphia where an elderly physician lived. He owned a copy of John Morgan's *A Discourse Upon the Institution of Medical Schools In*

America, perhaps the most remarkable book in American medicine. He told me he desired to sell it in order to give his favorite niece an appropriate present. This copy was in excellent condition, the only flaw was slight wear at the top of the spine due, no doubt, to those Philistines who pull books from shelves by this method. Inside the front cover was the blue penciled price of Leary's Book Store, a Philadelphia institution for one hundred years or so. The good doctor explained that his father had bought it at Leary's in the 1880's for twenty-five cents. Some months later I was at the Wellcome Library in London where I mentioned to Dr. Poynter, the Director, that I had a copy of Morgan's book. "Would you sell it?" he cried, "to this outpost of Yankee culture?" That famous library had no copy, so the copy sold by Leary's in the 1880's for twenty-five cents and sold to me in 1963 now resides on Euston Road in London. Incidentally, the physician was a godson of Howard A. "Kensington" Kelly (1858–1943), the famous Johns Hopkins University surgeon, and showed me a napkin ring which Kelly rendered at his christening.

One of my favorite adventures began with a telephone call from a New York auction house. It seems they had fifteen or twenty cartons of medical books which, in their opinion, were not fit for auction. Would I like to have them? If I would pay for the packing and shipping, I might have them. Two thoughts rushed through my mind. "Never look a gift horse in the mouth" and "even a blind pig finds an acorn." So the cartons duly arrived and among them were fifteen presentation copies of the first edition of Osler's *Principles and Practice of Medicine*. Among the recipients were his secretary and associates at Johns Hopkins. All were signed by Osler with appropriate sentiments. The blind pig found his acorn and the gift horse had beautiful teeth. I have often wondered why that auction house chose me and whether they had offered that "junk" to anyone else.

Other items come to mind, including a very important Autograph Letter Signed of Benjamin Silliman, the "Pooh-bah" of Yale; the forgery of Martin Luther's signature in a sixteenth-century medical book; a delightful book in French on how to sire only sons with a former owner's note on the title page complaining that the advice was no good.

But I also love the more modest books. Perhaps titles such as these might tickle your imagination. Consider "The Psychology of

Clothes." I wonder if there is a chapter on the stuffed shirt, or on the emperor's new clothes, or even on Lady Godiva.

I have a text on lightning, a handy volume if you are ever in a thunder storm. Perhaps my favorite is "Left-handedness in Cattle." You will recall that a horse always rises with the forelegs first. But cattle the reverse. About ninety-five percent of cattle put out the right leg first and five percent the left. It is said the osprey always carries his fish in the right claw. "There is more 'twixt heaven and earth, Horatio, than is dreamt of in your philosophy."

Then there was the Philadelphian, Dr. Charles D. Meigs, who lived in the middle of the last century and wrote medical books in the first person singular. He regarded anesthesia for women in child birth as "inappropriate." I wonder if he ever reflected that God put Adam to sleep when he removed that rib.

There are also those delightful home medical books of the Victorian era with such titles as "Advice for the Maiden, Wife and Mother" often illustrated with a clarity which brings the blush of modesty to the cheek of shame.

A title gone out of fashion but often used in the nineteenth century was "Diseases of Women and Children." I have never seen the medical title "Diseases of Men and Children." Indeed I have never heard of a book "Diseases of Men" except those shabby pamphlets published by persons who guarantee a cure if you don't mind going to a shady neighborhood. But of course, medical books were written by men up to our enlightened age.

All these remarks disclose that I am eclectic in my tastes. But there is also a joy in bookselling, in finding a home for my beloved books. And I have met so many interesting people, from Nobel laureates to anxious parents of medical students. Among these was a Russian diplomat who tried to pocket a letter by Larrey, Napoleon's surgeon; John Fulton, who played hooky from the meetings of The American Philosophical Society to spend time in a bookstore; the doctor from Buenos Aires who when I asked him how he learned of the book store replied, "When I said I was going to Philadelphia, my friends told me there was only one place you must go to in that city."

There were other forms of humor as well: someone brought Sir Geoffry Geffreson, the esteemed University of Liverpool physiologist, to my bookstore. While he was looking at the new books he said to me, "I see you have a Swede working for you." "A Swede Sir Geoffry?" I asked. "Why yes," he replied, "the person who

shelves the books for you" and he pointed to a volume among the dental books—the title was "Disease of Yaws."

In closing, permit me to say there is a unique relationship between bookselling and collecting. It is a special kind of friendship, one that does not, I think, exist in other business transactions. The collector has bookseller friends in many places and the bookseller has his as well.

It is forty-two years since I embarked on bookselling. I wish I had another forty-two among these oceans of books. Perhaps I will —in forty-two years I will be only one hundred and twenty-three years old.

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Culture and Class Conflict at the New York Asylum for Lying-In Women, 1823–1850

VIRGINIA A. METAXAS QUIROGA

Introduction

In early nineteenth-century America, women most typically gave birth at home, surrounded by a community of women who supervised the care of the parturient before, during, and after birth. With the growth of industrialized cities, difficult economic circumstances often had negative effects upon family stability, forcing growing numbers of poor women to find it difficult to adhere to traditional home childbirth. They often found themselves turning to the services of welfare institutions, such as city almshouses, or if they were fortunate, to private lying-in centers. Unlike the medical care of modern hospitals, these institutions mainly served the social needs of their clients, by providing women with temporary homes in their time of need.

In 1823, a small group of middle class charity women founded the New York Asylum for Lying-In Women (NYALIW), a private institution to help women whom they considered to be respectable. The founding "lady managers," as they called themselves, believed that the care of parturient women belonged within the confines of women's sphere. Thus at the Asylum, they conserved many earlier familial and female-dominated childbirth customs in the newly-conceived institutional setting, while at the same time projecting their beliefs about moral respectability upon their working-class sisters.

Yet by 1850, the original goals and aspirations of the founders of the NYALIW would be eroded by the changing needs and expectations of two other groups associated with the institution: the patients and the physicians. Lady managers found that they could not reach the goal of having a moral influence over patients because a growing majority chose to avoid contact with them by utilizing

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the "outdoor" service. Similarly, the leaders' control over traditional childbirth was also challenged as male physicians attached to the outdoor service became more involved in the care of patients. My analysis of the relationships between the patients, founders, and physicians of the NYALIW suggests that poor women, like their sisters of more fortunate circumstances, were active agents who acted on their own behalf in making decisions pertaining to their own childbirths.[1]

The Origins of the Asylum

During the 1820's, New York City received more than seven thousand indigent immigrants per year, many of whom required private or public relief.[2] By 1825, more than one hundred private relief organizations had been formed in the city in addition to the older established institutions — the municipally-run Almshouse (Bellevue Hospital), and the voluntary New York Hospital.[3] During this period, benevolent women of the upper classes dominated specialized fields of private philanthropy within women's sphere — charities which served the needs of widows, orphans, and other females in distress. Typical of the female voluntary organizations they founded were the Orphan Asylum Society, the Female Assistance Society, the Society for the Relief of Poor Widows with Small Children, and the New York Asylum for Lying-In Women.

The assumption that childbirth rightfully belonged within women's sphere was shared by both the female and male founders of the NYALIW. In 1823, as one female board member put it, when a few "humane, eminent physicians" discovered the plight of the city's pregnant poor, they automatically brought the situation to the attention of the benevolent women whom they assumed were the proper persons to act on behalf of the destitute women.[4] The women raised funds and appointed a female board of managers who made

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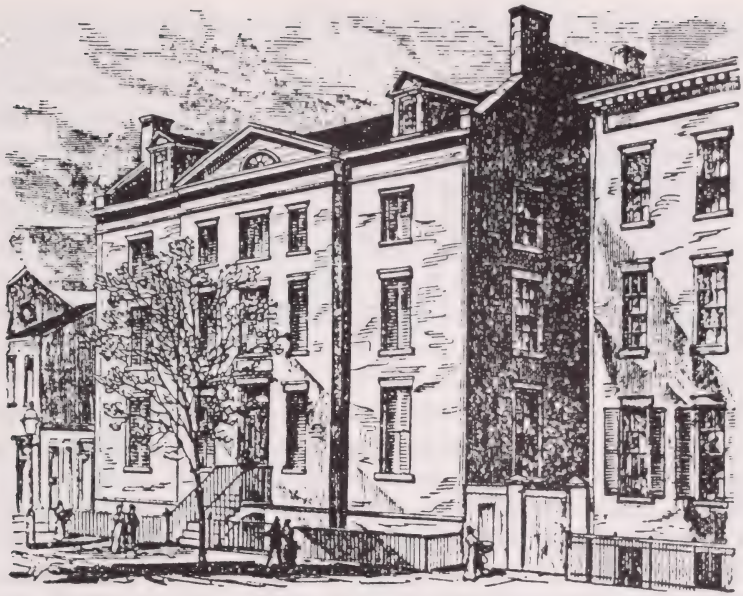
1. On women as active agents in childbirth decisions, see: Judith W. Leavitt, *Brought to Bed: Childbearing in America, 1750–1950* (New York, Oxford: Oxford University Press, 1986).

2. Raymond A. Mohl, *Poverty in New York 1783–1825* (New York: Oxford University Press, 1971), p. 24.

3. Ibid., p. 137.

4. Mrs. Reverend Thomas Mason, MS., n.t., (n.p.: n.d.). This manuscript is a hand-written history describing the founding of the New York Asylum for Lying-In Women. The manuscript is located at the New York Historical Society, Manuscript Division.



New York Asylum for Lying-in Women

all the decisions pertaining to the NYALIW. In the eyes of these women, the Asylum's work was an extension of their natural sphere —a mixture of charity and nurture for their less fortunate sisters.

However, the founders made one concession. Because they feared the dangers of childbirth—what one founder called "nature's severest trial"—these women shared responsibility for patients with male physicians. By the 1820's, male physicians had convinced many middle and upper class women of the efficacy of scientific obstetrics.[5] The founders appointed a board of "superintending" and "consulting" male physicians, although they seem never to have been completely comfortable with this decision. They only allowed the social nature of their good works to border upon medical care, they said, because of anxious feelings for their sisters' "future exigencies . . . with fearful forebodings of their approaching physical suffering."[6]

But the NYALIW never intended to go as far as other New York City childbirth institutions in cooperating with the medical

5. Judith W. Leavitt, "Science Enters the Birthing Room: Obstetrics In America Since the Eighteenth Century," *Journal of American History,* 1983, *70*:281–304.

6. Mason, MS.

establishment. For example, medical students were not permitted to train at the Asylum as they did at Bellevue or the short-lived Lying-In Hospital of the City of New York. In fact, few males were ever present at the Asylum at all. Most births were attended by a matron/midwife, unless there was an emergency. Otherwise, male physicians made only weekly rounds, at a set time of day.[7]

The founders attempted to create a reasonable facsimile of the traditional family support system that poor women lacked. The "family" was headed by a female matron, who was responsible for the overall maintenance of the household and its inhabitants. The Asylum was housed in a small three-story building, holding only a dozen beds, and patients cared for one another in a traditional community of women. The founders envisioned that the matron would maintain order within the institution, as a middle class housewife would in her own home, while she taught inmates proper middle class domestic habits. The family life they tried to recreate at the Asylum mirrored contemporary American middle class family values, and the matron was assigned to embody the combined tenets of the cult of domesticity and the cult of true womanhood. She was to bring domestic order, piety, and submission to the perceived disorder of her working-class patients' lives.

However, the Asylum's founders did not believe that all indigent women were worthy of their charity. "Fallen" women were not welcome at the Asylum. The constitution of the Asylum emphatically stated that the institution's purpose was to furnish comfortable accommodations and skillful medical care to *reputable married* females who desired an asylum during the period of their confinement.[8] The Asylum's managers wanted to be sure that the institution's reputation remained as spotless as it was deemed to be at its founding, when the NYALIW was called the only refuge that respectable women could turn to in their time of need. Many "virtuous" women (married) preferred to "suffer want" and even "hazard life" before subjecting themselves to association with the Almshouse and its presumed morally tainted inmates.[9]

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7. New York Asylum for Lying-In Women, (hereafter referred to as NYALIW) *By-Laws*; Visiting Committee Records, located at the New York Historical Society, Manuscript Division.

8. NYALIW, *Constitution* and *By-Laws*.

9. Mason, MS. The description was written shortly after the closing of the Lying-In Hospital of the City of New York (1827) which explains the comment that the NYALIW was the "only" alternative to the Almshouse.

The lady managers, therefore, were not simply worried about the insecurities that urban and industrial life brought to traditional childbirth customs, they were also concerned with the status of the institution of marriage itself. By refusing to aid or associate with women who in any way deviated from the accepted norm, they asserted a standard of moral behavior. They purposely ignored the plight of unmarried mothers, refusing to aid what they called the "virtuous and the vicious under the same roof," with the hope that such a policy would discourage the "criminal improvidence" of pregnancy outside of marriage. By doing so, they also assured themselves continued contributions from moralistic members of their class.[10]

Patient Care at the Asylum

The NYALIW's Visiting Committee Records show that the patients who entered the institution did so because of desperate economic circumstances. In 1823, Catherine Martin stated to the committee that her husband, a weaver, had left three months previously to look for work, and had not been heard from since. Others whose husbands' whereabouts were unknown reported similar stories. Martha Woodward, for example, declared in 1823 that her husband went to "visit some friends" and later dropped out of sight. Dolly Curtis' mariner husband had shipped out and left her destitute during what she referred to as "nature's severest trial," echoing contemporary attitudes toward childbirth.

Abandonment was not the only problem that brought patients to the Asylum for aid. Patients often reported that they were separated from their husbands, on account of their "ill usage of alcoholic beverage," as one committee member put it. According to their statements, Emma Conley's and Phebe Trace's estranged husbands were "intemperates." This explanation for marital separation was usually accepted by the Asylum's managers.[11] These case histories not only attest to the desperate economic circumstances of working-class women, they also reveal what middle class women expected

10. NYALIW, *Tenth Annual Report 1833*, p. 7.

11. MS., "New York Asylum for Lying-In Women Visiting Committee Book, 1823–1831," located at the New York Historical Society, Manuscript Division. The hand-written records contain several hundred case histories. Entries were made by different members of the committee, who rotated this and other tasks. No page numbers.

of husbands and their role in the family. The committee members expressed shock and sympathy toward women whose husbands failed to provide for them properly — especially if alcohol was involved in the case. The committee members regarded the family as a refuge where women should be protected by their husbands, especially during pregnancy. Among working-class women, of course, desperate economic realities precluded such luxuries.

Therefore, the Asylum did offer some comforting services to poverty-stricken women. Patients entered the Asylum, for example, to improve their prospects for future employment as wet-nurses. Unlike a woman who gave birth at the Almshouse, patients who were approved by the Asylum's Visiting Committee also gained a reputation that was above suspicion. Many patients entering the Asylum were house servants who had been dismissed from their positions. The Visiting Committee members took it upon themselves to provide middle and upper class New Yorkers with high quality wet-nurses by placing former inmates in "situations." They proudly announced this service in annual reports. In ecstatic tones, one such publication stated: "Our institute provides wet-nurses — their characters already investigated by the Visiting Committee, acquaintance of their tempers and dispositions can be gained from the matron, and information regarding their health can be provided by the physician. Perfect! [H]ow much of painful anxiety is saved to parents at such a moment?"[12]

By providing just what the doctor ordered, the Asylum insured its own future. The wet-nurse placement program was supported by the upper classes, not only by general contributions to the charity, but also by individual payments made to the institution to reserve the services of particular wet-nurses. A prospective employer, Mrs. Smith, for example, made a donation of twelve shillings a week in March 1827, to cover patient Dolin's board until she was called for in April.[13]

The prospect of a year-long wet-nurse "situation" provided at least temporary relief to the patient, who otherwise might have ended up at the Almshouse. The NYALIW's records do not make clear what happened to the babies of these patients, but they do document the fact that many patients became wet-nurses. In 1833, for example, of the sixty-nine women to give birth at the Asylum,

12. NYALIW, *Twentieth Annual Report 1843*, p. 7.
13. NYALIW, Visiting Committee Record.

twenty-four left as wet-nurses.[14] In 1843, of the one hundred ten patients to leave the Asylum, fifty-three had obtained situations as wet-nurses.[15] The Asylum continued this service until the end of the nineteenth century, when the practice of wet-nursing declined.

Aside from providing future employment, the Asylum's convenience to New York's working-class neighborhoods accounts for its use. It was located on Marion Street, in the heart of the fourteenth ward. The patient case records show that most patients lived within a short walking distance from the Asylum. The Almshouse, on the other hand, was located at "Bellevue, on the East River, two and one half miles distant from New York."[16] Being less accessible than the NYALIW, the Almshouse was not favored by patients in the fourteenth ward.

Patients avoided the Almshouse, in fact, whenever possible. In January 1829, when Frances Flanagan was rejected by the committee for entry into the Asylum, she was advised to see the commissioner at the Almshouse. She declared she would "stop by the wayside first." Some thought the Asylum offered better care. In 1826, an applying widow from the neighborhood of Five Points expressed her determination to postpone what she believed to be her inevitable entrance to the Almshouse until after her baby was born. A committee member of the Asylum reported that the patient stated that "she had been sick five weeks and she wanted good care or she feared she would die, she would not go to the Almshouse to be killed by them young doctors."[17]

Asylum care was superior to Almshouse care because patients could avoid legal problems. Women who entered the Almshouse claiming abandonment found that Almshouse officials commenced suits against their husbands for avoiding marital responsibilities. If caught, the husband was made to repay the city for the support of his wife. In cases where the claim of abandonment was a ruse, and the patient needed only the temporary shelter of the Almshouse

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14. NYALIW, *Tenth Annual Report 1833*, p. 3.
15. NYALIW, *Twentieth Annual Report 1843*, p. 5.
16. Quoted in n.a., "Report of the Committee Appointed by the Board of Guardians of the Poor of the City and Districts of Philadelphia to Visit the Cities of Baltimore, New-York, Providence, Boston, and Salem" in *The Almshouse Experience Collected Reports* (New York: Arno Press and the New York Times, 1971), p. 8.
17. NYALIW Visiting Committee Records.

while unable to earn her own living, the risk was too great, especially if it resulted in her husband's entanglement with the law.[18]

It is most likely that patients who rejected care at the Almshouse saw the Asylum as the lesser of the two institutional evils, but not necessarily for the same moralistic reasons that New York's middle and upper classes would have assumed. The Asylum's wet-nurse employment service, its proximity to home, its reputedly safer services, and its relative freedom from legal entanglements, all contributed to its popularity among the working class.

Patient Expectations of the Asylum

There are other reasons why patients turned to institutional care. Familiarity with institutional childbirth and male physician care among immigrant patients was probably the most important reason why the NYALIW was patronized in its early years; a factor which probably increased in importance as time went on. Especially after the huge Irish migrations which took place in the 1850's, a majority of the patients served by the institution were Irish immigrants, or their first-generation American descendants.[19] Irish immigrants, who had been exposed to institutional care for generations before their American counterparts, carried expectations for certain types of medical care and charity from the old country to the new. One of Dublin's lying-in hospitals, the Rotunda, for example, had a long history of providing maternity care. Huge numbers of patients were treated there: in 1760, 946; in 1800, 1,837; in 1817, 3,473; and in 1820, 2,458.[20]

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18. "Report of the Committee Appointed," in *The Almshouse Experience*, p. 12.

19. Patient case records include the following information: date of application; patient's name; address; nativity; physician's name; number of previous confinements; age of patient; presentation of fetus; number of hours of labor; sex and condition of offspring; date of confinement; and remarks. I found, in a random sample of one hundred seventy-nine patients, taken from the years 1857 and 1872, that one hundred fifty-eight patients were Irish-born; 8 American; 9 English; and one each from France, Scotland, Germany, and Canada. There were 25 first confinements; 29 second; 33 third; 26 fourth; 15 fifth; 7 sixth; 16 seventh; 4 eighth; 6 ninth; 2 tenth; 3 eleventh; 1 twelfth; and 1 fourteenth. The number of previous confinements was not always recorded. Patients ranged in age between eighteen and forty-one.

20. Denis Phelan, "Observations on the Comparative Advantages of Affording Obstetrics Attention . . . Their Own Homes," *Irish Journal of Medical Science*, 1867, *XLIII*:92.

When the Irish arrived in New York, they found institutional childbirth on a much smaller scale. While in 1820 over two thousand patients gave birth in Dublin's Rotunda, only thirty-three patients gave birth at New York's Almshouse — the city's largest welfare institution.[21] Between 1823 and 1833, the NYALIW received fewer than four hundred patients.[22] These numbers are dwarfed when compared to the 2,740 patients who were served at Dublin's Rotunda in 1825.[23]

In later years, Irish women were also exposed to physician-controlled births, both for home delivery and in the hospital, to a greater extent than American women, which may have predisposed them to seek physician care in New York. The Queens University Medical School of Belfast, for example, turned out six hundred obstetrical students between 1836 and 1849.[24] Between 1860 and 1869, Coombe Lying-In Hospital in Dublin attended 3,496 cases in the hospital, and 4,473 home labor cases, all by male physicians. From 1857–1864, Dublin's Rotunda reported 8,224 hospital and 617 home cases.[25] These two seven-year figures match the number of patients treated by the NYALIW in its entire first forty-four years.

Some homeland institutional traditions, however, were not available in New York. Irish immigrant women may have expected a much more open admission policy than that presented to them by their New York Protestant stewards. Patients of the Rotunda were not subjected to the kind of scrutiny that the managers of the New York Asylum tried to implement.

According to Dr. Skekleton, master physician of the Dublin Hospital in 1854, patients were freely admitted to lying-in hospitals in Ireland. In a statement made before the House of Commons Committee, Skekleton said that every woman who presented herself at the door was admitted, with no questions asked. No one was ever refused care, regardless of her economic or marital status; and moreover, Skekleton said, "we have no power to . . . [refuse any woman admission]." After being asked if the hospital was restricted to married women, Skekleton went on to say: "We never make

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21. n.a.,"Report of the Committee Appointed" p. 5.
22. NYALIW, *Tenth Annual Report 1833*.
23. Denis Phelan, "Observations on the Comparative . . . ," p. 92.
24. Quoted in C. H. G. Macafee, "The History of the Chair of Midwifery and Gynaecology in the Queen's University in Belfast," *The Ulster Medical Journal*, 1975, *44*(2):93.
25. Denis Phelan, "Observations on the Comparative . . . ," pp. 74–75.

inquiries; they [the patients] all pass as married women whether they have husbands or not."[26]

This practice reveals the open admissions policy which was typical of Catholic charitable institutions. Based on a different tradition than Protestant institutions, the Rotunda openly provided care to unmarried mothers and their illegitimate offspring. The governors accepted the notion that they could not prevent illicit pregnancies, and they wanted to prevent the incidence of abortion or infanticide, which were both considered horrible crimes against the church and the state. They therefore provided care for illegitimate children and their mothers.

Given the differences in the kind of care that patients may have expected and what was actually offered, the NYALIW surprisingly reported that most patients followed rules, and respected the authority of the matron and the lady managers.

Discord and Reform

At times, the unpublished Visiting Committee Reports commented on patients who did not follow the rules, or become sufficiently reformed. An entry made in September 1826 described a patient who "express[ed] but little and [did] not manifest as much gratitude as some, still she and the child both appear[ed] to be getting along well." Again, in December 1826, Mrs. Lucas left "voluntarily, being unable to comply with the regulations of the institution, in remaining within doors, and giving to the Matron all the assistance within her power." Another patient, Catherine V., "took her bundles and walked off saying she was of a very unhappy disposition and could not content herself to remain" even after the matron tried to "soothe her into acquiescence of her situation . . ." In October 1830, Mrs. Church had her permit taken from her after "coming to the Asylum in a state of intoxication and made a great deal of trouble otherwise . . ." In February 1831, Mrs. Ferrell left the Asylum "highly indignant that the rules of the institution should prevent her husband's visiting her . . ." She refused her dinner, and went on to say ". . . I have a very long walk before me, and I can truly say I leave the Asylum both cold and hungry."[27]

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26. Ibid., p. 83.
27. NYALIW, Visiting Committee Records.

These episodes suggest that patients were not passive, in spite of the efforts of the matron and lady managers. Non-compliance with, and intolerance of, the house rules indicate that some women actively resisted the effort to regulate their behavior. In the end, many of the rules initially set by the Asylum's founders caused enough patients to balk so that policy changes had to be made.

The marriage rule, for example, caused great internal debate among the leaders of the institution. On 6 May 1828, Mrs. Madden applied to Mrs. E.W. Blake and was refused admission for lack of sufficient proof of marriage. On 13 May, Blake expressed guilt about turning the patient away a second time, describing how the patient "wept bitterly upon being rejected which your committee felt an imperious duty, although her story was a very interesting one and told with so much appearance of candor and simplicity that it could hardly be doubted . . ." Naomi Booth's case in June 1826 also evoked discord among the lady managers. Naomi's "general appearance and manners won . . . the sympathies and confidence of the committee . . ." but they still refused to admit her, even though she explained that "where she married, in Ulster County, Ireland, it was not customary to ask for a certificate of marriage." The mails could not be trusted, she further pleaded, but her story did not satisfy those who chose to keep the reputation of the Asylum above reproach.[28]

Pressures to change the rules mounted when entry delays, caused by difficulty in obtaining sufficient "proof" of marriage, put the lives of patients in jeopardy. Such was the case during a very cold January, 1826, when a shivering and under-dressed woman named Burley applied for immediate entry without a certificate of marriage, and was told to return on the next day after references were checked to see "if her character proved her deserving." Turned out by the committee, Mrs. Burley was forced to sleep in an open garret that night where, alone, she gave birth to a baby girl. The next morning two workmen found her and the near-dead baby frozen to her clothing. The committee finally accepted the patient and her infant at the Asylum, where they eventually recuperated, only after finding the mother's character "satisfactory."[29]

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28. Ibid.

29. This case was described both in the Visiting Committee Records and in the *Fourth Annual Report 1827*.

The Burley incident in particular forced the Asylum's lady managers, all married women and probably mothers themselves, to face the fact that the judgments they made about the pregnant poor ultimately affected not only the woman, but her innocent newborn as well. This realization forced the more conservative women to compromise. From this point on, although all the Asylum's published records showed a continued commitment to the conservative policy — that is, that the Asylum's services were to be limited to married women only — in actual practice, this was not the case. Two changes occurred.

First, the record book entries show that the individual committee members increasingly established their own criteria for the acceptance or rejection of patients, as they sometimes required certification and sometimes simply believed the long stories of honest-sounding prospective patients. In spite of differences in class and values, some of the middle and upper class Protestant committee members discreetly overlooked ambiguities presented to them by their Irish Catholic clients. And prospective patients told committee members exactly what they wanted or needed to hear.

A second, and more important, change came about in 1831 with the development of an outdoor department that served as a safety valve to the internal pressures building up within the constraints of the institution. Patients did not have to be married to be served by the outdoor department. This new policy satisfied those lady managers who could not in clear conscience provide care to unmarried women, and those who could not turn patients away without assistance. Patients at last were provided with services they found familiar. As in the old country, they received free medical assistance, provided by male physicians, with relatively few strings — the one difference being that if they were unmarried and unable to remain in their own home, they could not use the services of the Asylum. The result of this limitation was that most Asylum patients remained married women.

Clinical Care

As was true in the Irish hospitals, the outdoor service was very popular among patients. Approximately seventy-five per cent of the Asylum's cumulative number of deliveries took place in the home of the patient. From 1823–1899, the total number of Asylum pa-

tients to give birth at home was 20,764, compared to 7,052 at the Asylum itself.[30]

The outdoor department allowed patients a much greater degree of privacy. Patients avoided all contact with the lady managers. They simply applied for care at the office, leaving a name, address, and approximate due date. Patients had no further contact with staff members until their actual labor began.

The outdoor department organized its pool of physicians similarly to the city's dispensary system. The city was divided in twenty-four districts, and individual "district" physicians were assigned to particular areas. Registered patients, upon the onset of labor, sent a message to the Asylum's officer, who in turn contacted the district physician. In the case of difficult or tedious labor, the district physicians were entitled to the same professional counsel as attending physicians at the Asylum—advice from one of the more experienced consulting physicians on the board.

Professional counsel was one of the only routines that the indoor and outdoor departments had in common. Although the annual reports do not stress differentiation in patient care, other records do. Patients of the outdoor department, for example, were utilized as "clinical material" with which to teach students of the New York University Medical College.

One of the founders of this medical school (founded in 1841) was Gunning S. Bedford, who studied obstetrics at the Maternity in Paris, and was well-known in American medical circles for his translation from the French of Chailly's *A Practical Treatise on Midwifery.* He saw to it that arrangements were made with the physicians of the NYALIW to make outdoor patients available for training medical students in obstetrics.[31]

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30. NYALIW, *Seventy-Fourth Annual Report 1899,* p. 9.

31. M. Chailly, *Practical Treatise on Midwifery,* translated from French and edited by G. S. Bedford, (New York: 1849). Bedford was born in Baltimore, Maryland in 1806 to a distinguished Southern Roman Catholic family. He graduated from St. Mary's College in 1826, Rutgers Medical College in 1829, and then made European visits to further his medical studies. He was Professor of Midwifery, Albany Medical College, 1836; Professor of Midwifery, University of New York, 1840–1862. He established a "clinique" for obstetrics in New York in 1850 where over thirty thousand patients were treated between 1850–1862. He died in New York City in 1870. Most of this biographical material was taken from n.a., *Sketch of the Late Professor Gunning S. Bedford, M.D.*, which is located at the New York Academy of Medicine, Rare Book Room, New York City.

One hundred case reports of patients attended by N.Y.U. medical students and Bedford during the years 1841–1842 describe patient care and the training of medical students.[32] In general, students worked in pairs, at first assisting in the birth of one or two cases, and then on their own. At most, students were present at four births, and the skill they gained through this training was contingent upon the particular circumstances of their cases. If they were fortunate enough to be assigned to what turned out to be a complicated case, the distinguished Professor Bedford would be called in, and they often witnessed an "instrumental" or forceps delivery. At times, students witnessed the "introduction of the hand" to deliver the placenta, or if all else failed, the pouring of ice water from a height above the abdomen, which usually resulted in the expulsion of the placenta and the stopping of hemorrhage. If births were routine, or if the messenger arrived too late for the student to arrive at the bedside of the patient on time, his clinical learning experience was severely circumscribed.

Beliefs and Practices: The Case of Dr. Bedford

An important aspect of the medical education received by these students was their socialization into professional relationships. One case in particular illustrated one young student's internalized deference toward his superiors, and the professional rivalry of those superiors as well. A woman was in labor for three days, and under the care of two attending physicians who failed to deliver her "on account of the deformity of her pelvis [which] was very small." A third physician was called in — unnamed by the reporting student — who tried to deliver her by forceps. After failing to deliver her, "he proposed the operation of craniotomy, but the Lady and her friends objected and wished Dr. Bedford sent for which was finally acceded to after calling forth some such remarks as the following from the gentleman who had failed with the forceps — he said he had more experience than Dr. Bedford had years — that he had been practicing for thirty years and thought he ought to know, etc., etc."

32. All quotes and references pertaining to these case reports were taken from "Reports of Cases Attended by Students of New York University Medical College and Physicians of the New York Asylum for Lying-In Women" which is located in the Manuscript Collection of the New York Academy of Medicine, listed under "Male Midwife Students Records." The reports cover the years 1841–1843 in seventy-one handwritten un-numbered pages. The record was kept by Anthony T. Morris, and it also includes a brief list of patients 1846–1847.

The report went on to say that the heroic Bedford arrived and delivered the stillborn baby by forceps, after which he gracefully retreated from the room. Then ". . . the physician in attendance proceeded to deliver the placenta which he succeeded in doing after pulling off the cord and introducing the blunt hook to detach and pull it away with." The student wrote, "this is a feat I never heard of before — nor never wish to again — but the worst of all was his stopping up the vagina with the bed clothes to stop the hemorrhage. The Lady died about six hours after her delivery from exhaustion." The student was emotionally drained by the incident. On the one hand, he was frustrated by the mismanagement of the case which resulted in the loss of the patient's life—in part due to the constraints of professional etiquette. On the other hand, the student was in awe over Bedford's confident display of skill with the forceps.

Particularly significant in the case is the fact that Bedford was called for upon the insistence of the patient, after the attending physician suggested performing the craniotomy operation. This operation entailed the removal of the unborn child from the uterus of the mother piece by piece, in the event that a vaginal birth could not take place, in order to save the life of the mother. Bedford was a Catholic, as was the patient in this case, therefore, for religious reasons, craniotomy was at all costs to be avoided. Catholic women, if they followed the rules set by their church, were to face death before allowing a craniotomy to take place. The child's life was not to be sacrificed to save the mother. Catholic physicians, moreover, were also bound by religious belief not to perform the operation.[33] Since Bedford shared the beliefs of his Catholic patients, and since he was highly skilled in the use of the forceps — which meant that craniotomy could most often be avoided — his presence in the Catholic community was important.

Although Bedford was an active figure in the development of the science of obstetrics, his relationship to the NYALIW was never publicized. His name was not mentioned in published Asylum documents, nor was the public ever made aware that Bedford's students

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33. For a discussion on the Roman Catholic Church's stand on craniotomy see: n.a., "Craniotomy: The Sacerdotal Physician vs. the Medical," *Irish Ecclesiastical Record*, 1888, *IX*:118–130; and Reverend Thomas Bourke, "Craniotomy in Relation to Medical Science," *Irish Ecclesiastical Record*, 1888, *IX*:350–354. Bourke says that between 1874 and 1888, only fourteen craniotomies were performed at the Rotunda (Dublin) Lying-In Hospital. This was a very small number, given the fact that twenty thousand childbirths took place at the hospital in those years.

were being trained in the outdoor department. While other institutions proudly announced such scientific activities, the leadership of the Asylum were uncomfortable with using patients as "clinical material."

Conclusions

After the opening of the outdoor department in 1831, which allowed unmarried mothers to be treated, and especially after Bedford's students received training with NYALIW patients in the 1840's, the Asylum took on a dual mission. It was no longer solely a charitable institution embodying the beliefs and values of middle class Protestant women. It had become an institution setting policies which were sometimes in direct conflict with the wishes of its founders in order to answer the needs and expectations of New York's growing immigrant population and its medical establishment. By dividing itself into the indoor and outdoor departments, the institution in effect insured its own future.

For a certain proportion of its patients, the NYALIW's indoor department successfully sustained the long-standing tradition whereby women cared for other women in childbirth, with a minimum of interference by men. It was not until 1899, when the NYALIW merged with the New York Infant Asylum that men were first admitted to the board. The indoor department provided patients with a home-like atmosphere and a temporary family at a time when radical social and economic change threatened traditional familial care.

Yet class interests were also operating in the routines and policies of the Asylum, which led many working-class women to reject the care offered in the indoor department. The upper class women who insisted upon reforming "respectable" married women were not so much interested on promoting the well-being of their sisters, as they were in trying to control the behavior of women of lesser means. They also took advantage of the economic difficulties of their patients when they opportunistically offered the services of the patients as wet-nurses to other women of their class.

Yet patients were not always victims of their upper class "superiors." As already mentioned, three-quarters of the Asylum's patients avoided all contact with the Lady Managers by using the outdoor facility. There they received the care that they wanted — from male physicians — without having to leave the privacy of their

own home. Of course these patients may have been taken advantage of because they served as clinical material for medical students, yet they themselves made the decision to call for such care. And unlike the women lady managers of the Asylum, the physicians never denied medical care based on moral reasons.

At the New York Asylum for Lying-In Women, cultural and class differences played an important role in formulating institutional policy, as did a growing interest of physicians in obstetrics. While many of these policies did provide help to women who were in difficult economic straits, that does not mean that patients did not act on their own behalf. Few working-class patients complied passively to the class-biased restrictions of their upper-class stewards.

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Anesthetist and Anesthesiologist: Technology in the Social Context of a Medical and Nursing Specialty

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The present system of delivery of pain control in American hospitals is the result of a set of medical, sociological, technological, and cultural factors which are peculiarly American. Readers of this journal are all aware that Americans discovered the first anesthetics and that W. Thomas Morton administered the first successful anesthetic during surgery at the Massachusetts General Hospital in 1846. This paper looks at the sequel to this achievement, how our health care system adapted to its new ability to relieve pain. In particular, I focus on the technological achievements and sociological tensions generated by the rise of two anesthesia professions, in medicine and in nursing, in the last hundred years in the United States.

First Anesthesia Medical Specialist

The delayed development of anesthesia as a medical specialty in the United States contrasts with the British experience. John Snow (1813–1858), an English physician, introduced an improved inhaler shortly after learning about Morton's discovery. He emphasized the special knowledge and techniques which helped to develop anesthesia into a medical specialty in Great Britain within a decade of its discovery.[1] The rapid acceptance of anesthesia in Great Britain also reflects the greater tolerance of medical specialists in a country which had coped with irregular practitioners for centuries.

The early history of anesthetic practice was that of what Snow called the "foul smelling stuff," chloroform, and its predecessor, diethyl ether. Ether, discovered by Valerius Cordus in 1540, is a liquid at room temperature, vaporizes at body temperature, and

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This paper was presented at a Wood Institute seminar at the College of Physicians of Philadelphia on 10 November 1983.

1. John Snow, *On Chloroform and Other Anesthetics: Their Action and Administration with a Memoir of the Author by Benjamin W. Richardson* (London: John Churchill, 1858).

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does not starve the body tissues of necessary oxygen. Ether supports respiration and circulation and is non-toxic to the vital organs. Ether is easily administered by dropping it on a cloth cone or a sponge and allowing it to vaporize at room temperature. Two major drawbacks are its extreme flammability and its irritation of the mucous membranes of the nose and throat, side effects which led to the search for other anesthetic agents. James Simpson of Edinburgh, unable to cope with the irritating gas while giving ether to his obstetrical patients, substituted chloroform in 1847, a substance that could be applied with a cloth dampened with the liquid. As a prominent surgeon, his views were respected and his leadership is credited with fostering anesthesia as a medical specialty in Great Britain.[2] Ether remained the anesthetic of choice, especially in the United States, after the first fatality due to chloroform was reported in England in 1848. This fatality and others led to a heightened awareness of, and continual investigations into, the safety of anesthetic drugs.[3] Snow's admonitions were not acted upon in the United States until the late nineteenth and early twentieth centuries, when physicians began to practice as anesthesia specialists. Up to this period, observers, interns, residents, nurses, surgeons, pharmacists, and dentists were among those selected to give the patient an anesthetic. The simple technique of dropping ether on a cloth shaped into a cone was favored in the United States, while the British and other Europeans continued to design and produce a variety of inhalers with masks for vaporizing and regulating the quantity of ether and chloroform, and in some instances mixing these gases, as well as diluting the anesthetic gases with oxygen and carbon dioxide. The equipment used on an anesthetized patient has considerably expanded to include devices for mixing gases stored under pressure, injecting local and regional pain relief drugs, providing artificial airways to permit breathing, lowering the body temperature, inducing greater muscle relaxation, and recording the primary physiological functions altered by anesthetics.[4]

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2. Nicholas M. Greene, *Anesthesiology and the University* (Philadelphia: J. B. Lippincott Co., 1975), p. 11.

3. Barbara M. Duncum, *The Development of Inhalation Anaesthesia* (Oxford: The Wellcome Historical Medical Museum by Oxford Univ. Press, 1947). This volume is a superb source for the history of British and continental anesthesia between 1846 and 1900. It also provides many illustrations of the numerous types of equipment produced to deliver anesthesia.

4. Crispin Stanley Ward, *Anaesthesia Equipment: Physical Principles and Maintenance* (Baltimore: William and Wilkins, 1975).

Anesthesia in the United States in the Twentieth Century

The American medical profession argued, during its period of professionalization, 1848–1905, that the technical requirements of anesthesia, and the dangers in its lax administration, dictated that its procedures be in the hands of regularly trained and licensed physicians. They validated this claim by committing the profession to the technical education of doctors, and their equipment with the latest, safest, and most effective anesthetic technology.

Success in establishing anesthesiology as an American medical specialty came from basic research and clinical efforts, and from the personalities of the original teachers and promoters of the professional specialty — Frederick Erdmann, Arthur Guedel, John Lundy, Emery Rovenstine, Ralph Waters, and Paul Wood. Erdmann organized the first American society of anesthetists in New York in 1905.[5] Originally named the Long Island Society of Anesthetists, it became the New York Society of Anesthetists in 1936, and the American Society of Anesthesiologists (ASA) in 1945, the title it currently bears. Wood concentrated his energies on the ASA and suggested other methods of administering and sustaining the anesthetic state. He collected books, pictures, equipment and memorabilia related to the discoveries and exploits of leading American anesthetists. This historical material eventually became part of a library and museum dedicated to him. He once called the place the "Anesthetist's Castle." The Wood Museum is located in Parkridge, Illinois in the ASA's administrative headquarters building. The ASA remained small until the 1960's, but its members were outstanding teachers, experimenters, and technologists who introduced students and colleagues to new methods, equipment and techniques which increased the range and safety of anesthesia drugs. In 1950, the ASA had 3,377 members; it now has about 26,000 members.

Guedel and Waters shared their ideas on improving anesthesia in correspondence which lasted over thirty years.[6] One fundamental project they worked on was the development of an improved tube

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5. Albert M. Betcher, "Historical Development of the American Society of Anesthesiologists, Inc." in *The Genesis of Contemporary Anesthesiology*, Perry P. Volpitto and Leroy D. Vandam, eds. (Springfield, Illinois: Charles C. Thomas, 1982).

6. Arthur Guedel Museum and Archives, at the University of the Pacific Medical School, San Francisco, California.

that could be inserted into the throat to supply oxygen and anesthetic gases directly to the trachea of the patient without permitting other fluids to escape into the lungs. To meet the immediate need for these catheters, Waters' daughter helped to make the first airtight trachea tubes. With the use of a pliable tube that was easily inserted, anesthetists could better induce and control the anesthetic gases provided to their patients, whether or not they required artificial respiration.

Guedel, the showman, presented his technique to his colleagues with a flare that rivalled that of the surgeons. To convince anesthetists of the safety and value of inserting a breathing tube with an inflated cuff into the anesthetized patient, Guedel carried out the "dunked dog" demonstration. He put a dog to sleep at the beginning of his talk before a medical convention in 1928. He inserted an intratracheal catheter with an inflatable cuff slipped over it, which he then connected to an air supply, and immersed the dog in a tank of water. At the conclusion of his talk he removed the dog from the tank and awakened it to show everyone that the tube he used was airtight and the animal unharmed, i.e. the trachea was sealed from the water. The dog, henceforth named "Airway," became Waters' pet.

Variety of Anesthetics

The great achievements of American medical anesthesiology have been technical, from Morton's discovery of 1846 to the present.

Hundreds of anesthetic drugs were described in the 152 pages of the appendix included in the first comprehensive American text on anesthesia published by James Taylor Gwathmey in 1914.[7] Up until the first World War it was common to use only one of a few types of anesthetics during an operation. Lundy introduced, in 1925, the idea of using several anesthesia drugs in combination which he called "balanced anesthesia." Later, when drugs were used specifically to alter the effects of other anesthetic drugs, Lundy's concept was refined to become "precision balanced anesthesia."[8]

Less consideration was given to the side effects of an anesthetic drug, until a greater variety of drugs and methods of administering

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7. James Taylor Gwathmey in collaboration with Charles Baskerville, Professor of Chemistry, CCNY, *Anesthesia* (New York: D. Appleton and Co., 1914).

8. James Eckman, "Dr. John Silas Lundy," 7 May 1973, Manuscript, American Society of Anesthesiology Library: Chicago, p. 3.

them became available after World War I.[9] Leroy Vandam, Professor of Anesthesia at the Harvard Medical School, publicly recorded in an insightful and frank lecture in 1976 the cost of developing a multiple based anesthesia. He stated that, "Although the mortality resulting from anesthesia probably was enhanced at first, subsequent experience with the use of multiple agents may have led to an apparent decrease. As a result, all of the new potent general anesthetics are used in balanced technics . . ."[10] Anesthesiologists were at the cutting edge of human drug studies. Vandam noted that extensive experimentation on human volunteers included the work of H. W. Haggard in the 1920s.[11] Vandam's Boston colleague, Henry K. Beecher, provided a thorough review of the issues in his paper "Experimentation in Man," with insights and rules for physicians to follow in undertaking human experimentation.[12]

Another very powerful anesthetic drug was first used without the patient's knowledge. The Canadians H. R. Griffith and G. E. Johnson injected the muscle relaxant curare, a drug studied by Claude Bernard a century earlier, into an unsuspecting patient who underwent an appendectomy in 1942.[13] Curare was injected because it was known to have enhanced other anesthetics given to animals. Curare was also introduced to treat mental illness at this time.[14] Thus curare offered the possibility of eliminating deep anesthesia, in addition to providing greater latitude to the anesthetist and surgeon in manipulating the bodily functions and tissues, and complimented Lundy's goal for balanced anesthesia.

Economy also played a role in the selection of anesthetic equipment and drugs. Nitrous oxide, or laughing gas, provides a safe and pain-free state during an operation, but was not as convenient to handle, and therefore not used for surgery until the end of the nineteenth century. Liquid nitrous oxide was available in cylinders by 1870. Because of its need to be stored as a compressed gas, nitrous oxide has always been more expensive than ether. In the

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9. Ralph M. Waters, "Pioneering in Anesthesiology," *Postgraduate Medicine*, 1948, *4*:267.

10. Leroy Vandam, "On the History of Ideas in Anaesthesia," *Anesthesia and Analgesia: Current Researches*, 1976, *55*:467–73.

11. Ibid., p. 470.

12. Henry K. Beecher, "Experimentation in Man," *JAMA*, 1959, *169*:461–478.

13. H. R. Griffith and G. E. Johnson, "Use of Curare in General Anesthesia," *Anesthesiology*, 1942, *3*:418–420.

14. Richard C. Gill, "The Genie in the Ampoule," *The Technology Review*, 1941, *47*:1–4.

nineteenth century nitrous oxide was most often applied by dentists, who only needed to sedate their patients for a brief period, and therefore required relatively small amounts of the gas. When nitrous oxide began to be used in the operating room, its greater cost limited its use to the wealthier patient. However the gas is not absorbed or altered by the body, and therefore, if cleansed, the same gas can be used repeatedly to keep the patient anesthetized.

To purify the nitrous oxide gas which has been administered to the patient, Dennis Jackson, in 1915, developed a re-breathing unit containing chemicals to absorb the carbon dioxide released by the patient.[15] Although Jackson was not the first to design a purifying device, his method was adopted by American anesthetists. Jackson added a container which held calcium hydrocarbonate and sodium hydrate to trap the exhaled nitrous oxide and remove the carbon dioxide. Ralph Waters improved Jackson's device, a cumbersome chamber, by replacing it with a canister of soda lime inserted into the breathing circuit between the patient and the breathing bag. Jackson was a research chemist and physiologist who did not share the anesthetist's fear of losing patients based on the cost of the anesthetic. He was concerned about the inability of poor patients to afford nitrous oxide.

Guedel revealed another motive for using nitrous oxide, which was of special concern to anesthetists who were anxious to increase the status of their specialty vis-à-vis their position in the American medical hierarchy. In a letter to the manufacturers Stoelting and Hicks of Chicago written on 28 April 1956, Guedel explained:

> Your estimate of the cost of anesthesia, exhibits a good deal more self confidence than I had, early in my game. Probably our greatest incentive to use N_2O [nitrous oxide], instead of ether for surgical anesthesia lay in the fact that owing to the high cost of nitrous oxide anesthesia, it was necessary that we charge more for anesthesia with this gas; etc. etc. And off the record, I would say 'very much more.' At first the charge for material to the patient was twenty five dollars per hour and, believe it or not, we got away with it for awhile. But do not be misled by my story telling enthusiasm. My bills in some cases would read — in finger amputations and the like in Industrial Surgery, for example: Anesthesia $5.00, cost of N_2O gas, $35.00.

15. Dennis E. Jackson, "A New Method for the Production of General Analgesia and Anaesthesia with a description of the Apparatus Used," *Journal of Laboratory and Clinical Medicine, 1*:1–12.

> But it was not for long that we were in the business of merchandizing anesthesia materials. It was not long before we were instructed by the commercial 'Fee adjustors' the Insurance companies, to cease the use of nitrous oxide gas in their patients. There is a little more in that story than just the story. There is the fact that nowadays, anesthesiology does not have *to perpetrate his value by subterfuge* (emphasis mine). Thanks to those few men who engineered our organizations in anesthesiology, and a mighty good bit of engineering they did, anesthesiology is an accredited specialty and justly so.[16]

Modern anesthetic equipment permits the anesthetist to constantly be aware of the patient's response to anesthetic drugs. As a result, the experienced anesthetist has gained an unparalleled knowledge of human physiology and the limits to which it may be altered by drugs.[17] Almost half the anesthetist's time today is spent in applying this equipment to record a plethora of physiological parameters on more than 75,000 anesthetized surgical patients each day in the United States, thus fulfilling L. W. Harding's claim in 1928 "that the anesthetist should be a medical graduate and be able to make a diagnosis continually from the time he starts the anesthetic until the patient leaves the operating room." As a diagnostician, the anesthetist performs an indispensable medical function.

Howard W. Haggard, noted author, physiologist, and experimenter with anesthesia drugs, exhorted the medical profession to educate and propagandize the public about the medical importance of this new field. Haggard's book *Devils, Drugs and Doctors,* first published in 1929, discussed the importance of engaging the public's attention, especially concerning the effects and uses of anesthesia. He noted the direct relationship between public opinion and the economic consequences for the physician. Haggard, in 1940,[18] contrasted the layman's enthusiastic acceptance of vitamins and his relative unawareness of advances in anesthesia. He attributed this unequal public response to the physician's inability to advertize and teach the importance of his anesthetic methods to the lay public. By not getting the message of anesthesia across to the patient, the anesthesiologist was neglecting half his responsibility to his profession and to his patients. The physician must not only be a depend-

16. Wood Library Museum, Chicago, Illinois.

17. Mark Murphy, "Profiles: Emery Rovenstine," part three, *The New Yorker,* 8 November 1947.

18. Howard W. Haggard, *Journal of Anesthesiology,* 1940, *1*:2–4.

able anesthetist, but must also help shape public opinion toward anesthesia.

Haggard's advice seems to have finally been heeded. Recently the anesthesiologist has impressed at least one news reporter with the importance of his specialty. In 1982, in an article on the front page of the *New York Times* about the operation to implant an artificial heart into Barney Clark, the writer declared:

> A minute-by-minute reconstruction of the extraordinary, tension-filled implantation procedure early Friday, and the critical hours that followed, shows that the anesthesiologists emerge as some of the most important members of the team, in addition to the surgeons, the developer of the device and the patient himself. These anesthesiologists put him to sleep by using a risky narcotic one hundred times more potent than morphine, which they thought, correctly, would not stop his heart, as they feared conventional anesthetics would.[19]

The newspaper also reported that anesthesiologists, by this time, were the highest paid physicians, according to a survey which revealed that their median income was $150,200 or thirteen per cent more than it had been in 1982.[20] This increase reflects the rising costs of both hospital care and medical insurance.

Medical Sociology of Anesthesia

Pioneers like Wood, Harding, and Haggard understood that the development of their specialty depended on its institutionalization within medicine. Anesthesia, organized as a sub-section of surgery in 1937, became a separate medical specialty in 1941. In 1945 the term *anesthesiology* replaced the word *anesthesia* in the title of the professional medical society composed of physician anesthesia specialists — The American Society of Anesthesiologists. Anesthesia became the sixteenth medical specialty to be supervised by the American Medical Association and controlled by a system of Board certification. To be qualified as an anesthesia specialist the physician candidate must pass written and practical examinations.

By the mid-twentieth century, physicians found that there were special problems in their profession. As early as 1949, Daniel C. Lortie concluded, in his Master's thesis for the University of Chi-

19. Lawrence K. Altman, "Heroics of Heart Surgery Emerge; For Patient, Sunrise is Beautiful," *Sunday New York Times*, 5 December 1982:1.

20. Undated and unnamed newsclipping with by-line Culver City.

cago,[21] that anesthesiologists occupied a peculiar sociological position within the medical profession. Anesthesiologists were defined by their technology, not their patients, and therefore lacked the usual medical opportunity to share patients with other physicians. The anesthesiologist could not refer patients to other doctors, a practice which other physicians regularly engage in. The anesthesiologist remains a "doctor without patients."

The anesthesiologist accepts patients brought into surgery and usually is not expected to have responsibility or even much contact with them before or after the operation. The esteem and respect of the anesthesiologist was further diminished since the hospital regarded anesthesia as a service under its jurisdiction. Therefore anesthesiologists, as members of the hospital staff, their only workplace, are salaried, instead of collecting fees from patients as other physicians do. The income from anesthesia is used by the hospital to help balance its budget and replace funds expended for services for which the hospital finds it more difficult to collect fees. Anesthesia, so vital to the success of an operation, is treated as a commodity and becomes an item on the patient's bill which is more acceptable.

The lesser ranking of anesthesiologists among physicians provided another barrier to the development of the specialty—the best medical students were not encouraged to enter the field, and those who did could be stigmatized as unable to succeed in other specialties.

The Rise of Trained Nursing and the Nurse Anesthetist

The first American post graduate trainee in anesthesia was Dr. Mary Ross, who studied at the University of Iowa under L. W. Harding.[22] She received her certificate in 1923. That the first anesthesiologist should be a woman is ironic, because it was the association of anesthesia with woman's work, according to Lortie, that undermined its status within American medicine at this time. His research revealed that anesthesia, until mid-century, was largely regarded as "nurse's work" and consequently the authority, prestige, and income of the anesthetist, as well as the anesthesiologist, was lower than that of other established medical specialists whose specialties were

21. Daniel C. Lortie, "Doctors Without Patients: The Anesthesiologist — A New Medical Specialist," Master's Thesis, University of Chicago, 1949.

22. William K. Hamilton and Jack Moyers, "Stuart C. Cullin," in *The Genesis of Contemporary Anesthesiology*, Perry P. Volpitto and Leroy D. Vandam, eds. (Springfield, Illinois: Charles C. Thomas, 1982), p. 122.

not open to nurses. The sociological picture is even more interesting because it was physicians, and especially surgeons, who insisted that anesthesia was best the province of the nurse. While anesthesia was a technology that justified the status of all regular physicians, and shaped their education and practice, its administration came to be largely in the hands of surgeons, whose professional expectations also shaped this new specialty. Surgeons determined who would anesthetize their patients. Throughout the twentieth century, surgeons have found it expedient to employ nurses as anesthetists. Nurses are less expensive than physicians, they had a reputation for being attentive to the surgeon, and nurses did not aspire to become surgeons, thus leaving the surgeon in full control of the operation and the patient. Nurses who assisted the surgeon by giving the anesthetic would earn their salaries.[23] Nurse anesthetists were noted for developing a good rapport with the patient and calming the excited and worried individual. Most nurse anesthetists were women and their supporting roles in the operating room are not unlike the woman's role in other professions and businesses.[24]

Alice Magaw, nurse anesthetist at the Mayo Clinic, elucidated the attributes of the nurse anesthetist in her paper published in 1906.[25] Her views have been quoted often by teachers in the field, especially her judgment that the nurse anesthetist is noted for her patience and ability to pay attention to the patient throughout a long operation, rather than converse, concentrate on the surgery, or find other potentially harmful ways to combat the boredom of having nothing to do while the patient is comfortably resting. Thus, the nurse anesthetist is better prepared to detect a sudden change in the patient and be alert to a crisis should it occur.

Nurse anesthetists were employed by William Halsted, the Mayo brothers, Alfred Blalock, and other outstanding surgeons. Nurse anesthetists developed their own reputations. Margaret Boise, who worked with Halsted and with the surgeon Hugh H. Young, invented a simple machine for administration of ether and gas to

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23. C. William Hoelflich, "Anesthesia — Then and Now," *Current Research: Anesthesia and Analgesia,* 1933, *12*:89.

24. Barbara Melosh, *"The Physician's Hand": Work Culture and Conflict in American Nursing* (Philadelphia: Temple University Press, 1982).

25. Alice Magaw, "A Review of over 1400 Surgical Anaesthesias," *Surgery, Gynecology and Obstetrics,* 1906, *3*:796–799.

tonsillectomy patients.[26] Agatha C. Hodgins promoted the use of nitrous oxide in surgery, under George Washington Crile's direction, at the Lakeside Hospital in Cleveland. Hodgins provided the driving force in the formation of the American Association of Nurse Anesthetists (AANA) in 1931.[27] Nurse anesthetists also pioneered in giving anesthetics during some of the earliest major operations within the chest. Among these prominent teams of surgeon and nurse anesthetist were Claude Beck and Miriam G. Shupp at University Hospital, Cleveland, and later, Beck and nurse anesthetist Gertrude Fife, and Evarts Graham, surgeon, and Helen Lamb at Barnes Hospital in St. Louis.[28]

As nurses professionalized in the twentieth century, they followed the same route as the physicians who specialized in anesthesiology, forming professional organizations, and developing a sense of the status and autonomy of their work. In 1931, nurses who gave anesthetics organized the American Association of Nurse Anesthetists which, as a professional society, established the educational requirements that the nurse anesthetist must meet and standardized the functions and duties of this profession. The AANA now has about 24,000 members.

Inevitably, the creation of a second profession involved in administering anesthesia has led to competition as well as cooperation. The AANA and ASA have engaged in rivalry throughout most of their existence, stemming from the gender of their membership, the equipment each employs, their relationships to surgeons and patients, and the idiosyncracies of skills, talents, friendships, and motivations which have evolved with the techniques for alleviating pain during surgery. American anesthesia is an anomaly in that two specialties, one composed of physicians and the other of nurses, in almost equal numbers deliver anesthetics to patients.[29]

Americans have long debated who should practice anesthesiology, how one should qualify to become an anesthetic specialist, and what comprise the acceptable instruments, drugs, and methods of the field. Anesthesia, because it promised relief from suffering, went

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26. Virginia S. Thatcher, *History of Anesthesia with Emphasis on the Nurse Specialist* (Philadelphia: J. B. Lippincott Co, 1953), p. 85. This book is currently being revised.

27. Ibid., p. 72–74.

28. Ibid., p. 160.

29. D. D. C. Howat, "Anaesthesia as a Career," *Anaesthesia*, 1977, *32*: 979–995.

to the heart of the doctor's mandate — and the nurse's: the tension between caring and curing, the rivalry between the professions of medicine and nursing, as well as the roles of men and women in health care.[30] The ambivalence of the answers that Americans have given to these questions helps explain the delay in the recognition of anesthesiology as a medical specialty, and highlights the complex interplay of scientific and sociological interests in the history of this profession.[31]

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30. Audrey B. Davis, "The Development of Anesthesia," *American Scientist*, 1982, *70*: 522–528. This article and the references will lead the reader into the many aspects of the discovery of anesthesia for surgical procedures and those who have analyzed its history and upon which the historical data in this article is based. The reader should particularly see Martin S. Pernick, *A Calculus of Suffering: Pain, Professionalism and Anesthesia in Nineteenth-Century America* (New York: Columbia Univ. Press, 1985). For reprints and brief biographies of anesthetists see Albert Falconer, Jr. and Thomas E. Keys, Eds. *Foundational Anesthesiology*, 2 vol. (Springfield, Illinois: Charles C. Thomas, 1965) "Anesthesia" is the American spelling and "anaesthesia" remains the British spelling.

31. I am grateful to the Editor of *Transactions & Studies of the College of Physicians of Philadelphia* for her help in the revision of this article.

Special Section: Women and Medicine

Looking Forward

By courtesy of the Y.W.C.A. Photo Serv

A Woman Physician Who is Also a Mother

The girl of today will be the woman of tomorrow

She will need brains, vitality, and sound training, if she is to take her place in the world as a mother and a useful citizen

Section Frontispiece. "Looking Forward," YWCA photograph used in the American Social Hygiene Association's "Youth and Life" Poster, 1922. Courtesy of the Social Welfare History Archives.

Excerpts from "The Valedictory Address to the Twentieth Graduating Class of the Woman's Medical College of Pennsylvania, 1872"

HENRY HARTSHORNE

"Is the training and commissioning of women for intelligent, well-informed ministration to the sick, so as to use for their benefit the resources of science and the skills of art, right, or wrong?

". . . If it be right, it is a great right; and if it be wrong it is a serious wrong. Looking back upon our own solution of the inquiry, we may remember, that it involves, truly, two questions; one, whether the competency attainable by women for the medical profession be such that it is expedient for any of them to enter it, and the other, whether they have the right to choose and judge of their own vocation for themselves. This last query is most easily answered; it savors of the semi-barbaric mental habit of the harem and the wigwam, for any one ever to have hesitated a moment about its answer. Yet it has been met with a negation by some men. Perhaps it has happened only by a political accident that no Chief Justice in any republic has yet decided, that women have no prerogatives which men are bound to respect. Still, this question, whether women are entitled, as well as men, to choose any vocation respectable in itself, appeals so closely to common sense as well as common right, that many have decided it for themselves affirmatively, long before they have settled the other problem, as to the fitness of women for the profession.

". . . There are yet some qualities in women's mental constitution which are especially favorable to their usefulness as medical practitioners. These are, delicate and quick perceptions, sagacious intuitions, and warm personal sympathies. It is not always the most *logical,* but often the most *discerning* physician who succeeds best at the bedside. Medicine is indeed a science, but its practice is an art. Those who bring the quick eye, the receptive ear, and delicate touch, intensified, all of them, by a warm sympathetic temperament, to the apprehension of disease and its cure, may *use* the learning of laborious accumulators, often, better than they themselves could do."

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"Looking Forward": An Exhibit on Women and Medicine at the College of Physicians of Philadelphia

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New faces, the faces of women, have appeared over the last century in large numbers within medicine, an area traditionally dominated by men. This change in demographics prompts many questions: for example, how will the growing population of women change the profession, and more specifically, will the presence of a substantial number of women change the nature of the doctor/patient relationship? In commemoration of Women's History Month, March 1988, the Measey Foundation Workshop, described below, developed a museum exhibit to illustrate the changing participation of women in the practice of medicine over the last one hundred and fifty years. Kim Tieger, of the Mütter Museum, designed and mounted the exhibit.

The objects in the exhibit told the story of American women since the rise of professional medicine in the nineteenth century. They illustrated the role expectations of women in the home and in public realms, the opposition to women as both students and practitioners of medicine, and the struggle to transform beliefs about women's intellectual and physiological lack of fitness for the strenuous life of a physician. The exhibit began with nineteenth-century women "Looking Forward" (as in the frontispiece to this section of *Transactions & Studies*) to their success as physicians with a status equal to that of men, and an opportunity to bring all their skills to the care of the sick. The exhibit looked at the history of the evolving profession and the progress of women as doctors and nurses. A synthesis of recent research on the roles of modern women physicians closed the exhibit, and explored such issues as the career choices of the two sexes, their relative professional status and financial success, and their characteristics as practicing physicians and as private individuals.

The entrance of women into the public arena as physicians marked a revolution of broad political and social significance. It

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was not until 1896 that the first major eastern university, Johns Hopkins Medical College, formally admitted women to study medicine in classes integrated with men. Until that time, a high level of male/female role specialization was the norm. As home based production yielded to industrial capitalism, educational and vocational opportunities opened for men who came to dominate public life. Women, on the other hand, assumed a domestic role that reached almost mythic proportions. As women became more confined to the home, their work centered increasingly on responsibility for family welfare, including organization of the household, care of the children, and maintenance of family health. Her tools were those of the household. Men and women believed that woman had a special intuitive, moral, and healing nature which fitted her for this role.[1]

The early nineteenth-century health reform and sectarian movements boosted women's confidence in themselves by reinforcing and encouraging development of their identity as healers in family life. In addition, these movements encouraged women to move into the public arena where they would assert their special moral, healing nature, in the cure of society's social and health problems. Many women depended on sectarian and health reform lectures, journals, and manuals to guide them in caring for their families. William Buchan's *Domestic Medicine* reached the lives of many as a standard reference from 1772 to 1871. Texts such as Wooster Beach's *An Improved System of Midwifery* (1st edition, 1847) helped midwives and the communities of women who traditionally managed childbirth in the home, with graphic illustrations (See Fig. 1).

Few other educational opportunities existed for women, however. Educating women was deemed improper; it was feared not only that women's "female physiology" made them unfit for the classroom, but also that education would destroy a woman's capacity for child bearing. Both men and women held this pervasive opinion. Many of the first generation of women seeking medical education found themselves unwelcome in regular medical schools by men who used this rationale to exclude them. Many women turned instead to the sectarian schools which proliferated at this time.

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1. Regina Markell Morantz-Sanchez, *Sympathy and Science: Women Physicians in American Medicine* (New York: Oxford University Press, 1985).

Figure 1. Wooster Beach, *An Improved System of Midwifery, Adapted to the Reformed Practice of Medicine; Illustrated by Numerous Plates. To Which is Annexed, a Compendium of the Treatment of Female and Infantile Diseases, with Remarks on Physiological and Moral Elevation*, New York: Baker & Scribner, 1848.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

The health reformers found support from a public increasingly skeptical of the practice of regular physicians. Early nineteenth-century physicians still treated their patients with centuries-old formulas based on Galen's theory of illness. In efforts to restore the body to a healthful balance, physicians bled and purged their patients and often medicated them with poisonous compounds. While the public sought gentler, more effective treatments, elite physicians were making scientific and technical discoveries which would revolutionize the practice of regular medicine. The invention of anesthesia and the use of forceps for childbirth are cases in point (See Fig. 2, Simpson's forceps of 1848). Used in conjunction with anesthesia, forceps could make a difficult childbirth less painful for the mother and safer for both mother and child. Many women and their husbands began to prefer physician-assisted birth in the hospital over a midwife-assisted birth in the home, thus encouraging a

technological obstetrics that soon made obsolescent the traditional women's practice of midwifery.[2]

The "Agnew Clinic" by Thomas Eakins is a symbol of the modern medical world with white gowns, anesthesia, invasive surgery, and specialty training for doctors in the hospital. Eakins highlights the arrival of another new specialty: trained nursing. Mary Clymer, a graduate of the second class of nurses of the Hospital of the University of Pennsylvania in 1889, is the calm nursing presence at the mastectomy pictured here.[3] The professionalizing world of the new medical hospitals facilitated the rapid development of nursing, according to the model developed by Florence Nightingale, and also depended heavily on it. Nightingale (1820–1910) led a worldwide revolution in nursing education and practice by creating a respectable, dependable cadre of nurses. This new profession was rapidly assimilated into the hospital which needed the work of nurses, and into a culture which saw the family as a prototype for social structure. The male/physician made the decisions about treatment while the nurse followed the physician's direction as a dutiful daughter.[4] This cultural stereotype of the nurse is captured in the doll (See Fig. 2) exhibiting the uniform worn at the first public commencement of Women's Hospital in 1883.

Mary Clymer was an exemplary nurse whose diary at the University of Pennsylvania School of Nursing records without complaint the daily drudgery of nursing work in the late nineteenth century. The College of Physicians provided local physicians with a nursing directory which records the faithful service of Mary Clymer from 1891 to 1896. She was "first class in every respect," said one doctor, and "in every way satisfactory and a comfort" according to a family that hired her.[5]

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2. Judith Walzer Leavitt, *Brought to Bed: Childbearing in America 1750 to 1950* (New York: Oxford University Press, 1986).

3. Patricia Hills et al, "II. *The Agnew Clinic*: Medicine, Art, Literature in Late Nineteenth-Century Philadelphia," *Prospects: An Annual of American Cultural Studies,* 1987, *11*:157–230.

4. Charles E. Rosenberg, *The Care of Strangers: The Rise of America's Hospital System* (New York: Basic Books, 1987); Susan M. Reverby, *Ordered to Care: The Dilemma of American Nursing, 1850–1945* (New York: Cambridge University Press, 1987); Susan M. Reverby, "A Legitimate Relationship: Nursing, Hospitals and Science in the Twentieth Century," in Diana E. Long and Janet Golden, eds., *The American General Hospital: Communities and Social Contexts* (Ithaca, NY: Cornell University Press, forthcoming).

5. *Directory of Nurses of the College of Physicians,* Vol. C, p. 426. Historical Collections, College of Physicians of Philadelphia.

Figure 2. Simpson Obstetrical Forceps with Ebony Handles; Doll Wearing Nursing Uniform of Woman's Hospital, 1883; Anesthesia Kit from the Estate of William Hewson, M.D., Philadelphia.
Courtesy of the Mütter Museum, College of Physicians of Philadelphia.

Some women hoped for more, to be physicians who could bridge the gap between the growing scientific knowledge held by men and the healing powers traditionally exercised by women within the home and family. While mastering scientific information, they hoped as well to transform medicine into a more humanistic and responsive profession.[6] Most medical schools, however, refused to accept women as students since they were considered physically and emotionally unfit for strenuous intellectual activity. The first woman to break this barrier was Elizabeth Blackwell, admitted to Geneva

6. Morantz-Sanchez, *Sympathy and Science*, p. 46; G. Virginia Drachtman, *Hospital with a Heart: Women Doctors and the Paradox of Separatism at the New England Hospital 1862–1969* (Ithaca, NY: Cornell University Press, 1984).

Medical College in 1847 after a raucous vote by the student body who considered the admission of a woman a joke. She graduated at the top of her class in 1849, becoming the first American woman to obtain a medical degree. Both her education at Geneva and her subsequent clinical training were lonely struggles. As she wrote to her sister Emily, "A blank wall of social and professional antagonism faces the woman physician that forms a situation of painful loneliness, leaving her without support, respect, or professional counsel."[7]

Women found they were not welcome in the emerging science-based medical schools or in the hospital training programs. The only way to insure medical education for women in such an atmosphere was to open separate women's medical colleges. Women's Medical College of Pennsylvania, founded in 1850, was the first regular medical college for women in the world. Although many women considered segregated women's medical education a temporary solution that would become unnecessary when male medical opinion changed, others felt the support and understanding gained by studying among women was crucial for success. The women's medical schools found it essential to maintain the highest standards of education and many produced superior physicians, although many male physicians used the rationale that they received inferior education as a basis for excluding them from the profession once they completed school.

From the time Women's Medical College of Pennsylvania opened, Philadelphia and its medical community were destined to play a major role in the struggle over the integration of women into the medical mainstream. The controversy over recognition of women physicians was especially intense here and stirred bitter debate in the county and state medical societies as well as in the American Medical Association. The reformers of regular medicine not only had little place for women but also had a special need to exclude the sectarian and non-conforming schools to which women had been especially attracted. Ann Preston, the first dean of Women's Medical College, led the fight for women's rights from the college classroom to hospital training and medical practice. In 1850, Preston signed a resolution requesting the recognition of women doctors by the Philadelphia County Medical Society. In 1858, the Board of

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7. Ruth J. Abram, ed., *"Send Us a Lady Physician": Women Doctors in America, 1835–1920* (New York: Norton Publishers, 1985), p. 76.

Censors of that society resolved to prohibit its members from holding professional intercourse with alumnae of women's medical colleges and with the institutions which allowed women to practice. The State Medical Society followed suit but local societies like the Montgomery County Medical Society, as reported by its delegate Hiram Corson, felt "compelled to dissent from the action." [8]

In 1868, the Fellows of the College of Physicians of Philadelphia voted to table a similar resolution so as not to enflame a split within the Fellowship. David Hayes Agnew, the prominent surgeon and Fellow of the College, temporarily resigned as Chief of Surgery at the Pennsylvania Hospital when the Board of Managers there granted Ann Preston's request that her women students attend the Saturday teaching clinic in surgery. Alfred Stillé, another prominent Fellow of the College and President of the American Medical Association in 1871, on the other hand, encouraged women to attend his lectures at the Pennsylvania Hospital. It was not until 1932 that the Fellows elected Catherine Macfarlane, M.D., as the first woman Fellow of the College of Physicians of Philadelphia.[9]

Support for women physicians slowly mounted through careful lobbying by women physicians and their supportive male colleagues. Henry Hartshorne's 1872 valedictory address to Women's Medical College, excerpted above, was an early and prescient voice in what became a persuasive chorus. The Pennsylvania State Medical Society rescinded its ban on women physicians in 1871. In 1876, the American Medical Association informally recognized women by accepting Dr. Sarah Hackett Stevenson as the State Representative from Illinois. Formal recognition by the American Medical Association came in 1915.

The accomplishments of women physicians in both clinical and scientific medicine in the late nineteenth century reflected both the excellence of their education and the enthusiasm with which they practiced. In 1876, Mary Putnam Jacobi, in a blind judging, won the Harvard Medical School's Boyleston Prize for her dissertation "The Question of Rest for Women During Menstruation." By presentation of carefully analyzed data, Jacobi refuted the notion that

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8. Hiram Corson, *A Brief Account of the Proceedings in the Medical Society of Pennsylvania . . . to Procure the Recognition of Women Physicians by the Medical Profession of the State* (Philadelphia: James B. Rogers, 1888).

9. Whitfield J. Bell, Jr., *The College of Physicians of Philadelphia: a Bicentennial History* (Canton, MA: Science History Publications USA, 1987), pp. 142–145, 252.

menstruation made women constitutionally incapable of withstanding the stresses of higher education and medical practice. Physicians like Jacobi, who won the grudging respect of male colleagues, provided strong, vigorous models for younger women. Jacobi, married and the mother of two children, advocated an integrated life of medicine and family for women and for men.[10]

By 1900, women in the regular medical profession numbered 590, about 5.6 percent of the whole. They had won admission to some medical societies and to medical colleges from California to Cornell. As women were admitted into the medical mainstream, many of the women's medical colleges closed, feeling that this signaled full recognition and integration into the profession. The result of these closings was the loss of teaching positions and leadership roles for women physicians, and the subsequent loss of role models for younger women physicians.[11] Women's Medical College of Pennsylvania was the only women's medical college to survive until 1970, when it admitted men.

After 1889, the year that Thomas Eakins painted the "Agnew Clinic," the scientific basis for medicine shifted. Surgeons like David Hayes Agnew had taken the lead in establishing their special expertise and special work place, the general hospital. In Philadelphia General Hospital (PGH), women like Amelia Gilmore found a place at the pathology table in 1887 with other students of William Osler; by 1903, PGH resident Georgina Walters was able to take center stage at the Dead House (See Fig. 3).

Scientific medicine placed an emphasis on laboratory skills and encouraged new medical sciences like biochemistry and histology. John Shaw Billings, the first Professor of Hygiene at the University of Pennsylvania, exemplified the relevance of another recently defined specialty: Public Health. With their mixture of social service and scientific opportunity, these emerging specialties attracted the growing population of college educated women. Scientific laboratories proliferated in the field of medicine in the 1920's. Women entered into their research life as secretaries, technicians and investigators. Rapidly growing and interdisciplinary research areas welcomed these workers. The George S. Cox Institute for the Study of Diabetes at the University of Pennsylvania is a case in point (See Fig. 4).

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10. Morantz-Sanchez, *Sympathy and Science,* p. 55.
11. Abram, ed., *Lady Physician,* p. 168.

Figure 3. Georgina Walter, M.D., conducts an autopsy as a Resident Physician at Philadelphia General Hospital, 1903.

Courtesy of the PGH Photograph Collection, Historical Collections, College of Physicians of Philadelphia.

Social pressures after the first World War, however, discouraged women from competing with men, while ratification of the Nineteenth Amendment in 1920 diminished the intensity of the women's movement even as it granted them the vote. Women faced discrimination in obtaining degrees, positions, and recognition when medical science and academic practice became high prestige careers in the inter-war period.

Some women met the challenge to be "twice as good to get half as far" as their male colleagues, while more chose to stay away from medicine. The result was a decline in the percentage of women practitioners in America between 1910 and 1940 from 6 percent to 4.6 percent.[12]

Individual women, however, were remarkably resourceful in finding or creating new niches for themselves, often in interdiscipli-

12. Mary Roth Walsh, *"Doctors Wanted: No Women Need Apply": Sexual Barriers in the Medical Profession* (New Haven, CT: Yale University Press, 1977), pp. 178–267.

Figure 4. The George S. Cox Institute, University of Pennsylvania, in 1932. Front row: Dorothy Quinn, Elizabeth Barth, Miss Case, Margaret Gerstley. Back row: Gerald Evans, Francis Lukens, F.C. Dohan, C.N.H. Long, Russell Richardson, Morris Bowie and W.C. Whitaker.
Courtesy of Diana E. Long, Ph.D.

nary or applied fields that the mainstream of medicine had not yet discovered. The careers of distinguished women Fellows of the College of Physicians of Philadelphia reflect the good use that women made of these opportunities. Alma Dea Morani received her M.D. in 1931 from the Women's Medical College and then became the first woman surgical resident at that college. Dr. Morani achieved distinction in her profession of Plastic Surgery and her avocation of sculpture. Her plaster casts of her own hands are part of her series of the hands of women surgeons in the Alma Dea Morani Museum at the Medical College of Pennsylvania (See Fig. 5).

Catherine Sturgis (1903–1987) received her M.D. in 1940 at the age of thirty-seven. She specialized in pulmonary medicine and made her career in preventive medicine and public health. She was Professor of Preventive Medicine at Medical College of Pennsylvania and served as the only woman President of the College of Physicians of Philadelphia to date (See Fig. 6).

Figure 5. The Hands of Alma Dea Morani, M.D., cast by Salvatore Morani, from the Series "The Hands of Fourteen Women Surgeons," cast by Alma Dea Morani.
Courtesy of Alma Dea Morani, M.D.

Emily H. Mudd, Ph.D., was a pioneer in the development of new social services in medicine, birth control, and family counseling. After eleven years working at the Phipps Institute for Tuberculosis with her physician-husband Stewart Mudd, Dr. Mudd became the first director of the Marriage Council of Philadelphia, and Director of the Division of Family Study in Psychiatry at the University of Pennsylvania. She has recently served as Secretary of the College of Physicians of Philadelphia. Her speech at the American Civil Liberties Union banquet honoring her work in 1989 is published in this issue of *Transactions & Studies of the College of Physicians of Philadelphia.*

Despite the successes of such extraordinary women, medicine remained a difficult profession for women well into the 1950's. Under the influence of the women's movement of the 1960s, how-

Figure 6. Catherine Sturgis, M.D.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

ever, the number of women in medicine increased rapidly and continues to grow; current medical school classes are now about one third female.[13]

What difference will this increase in female physicians mean for the profession, for the women who are doctors and patients, and for the medical care we receive? These are profound and com-

13. "AMA Women in Medicine Project," *In The Marketplace*, 2nd ed. (Chicago: American Medical Association, 1987). See also Philip R. Klepke, William D. Marder, and Anne B. Silberger, *The Demographics of Physician Supply: Trends and Projections* (Chicago: American Medical Association, 1987).

plex social questions. As an introduction to them, the exhibit presented graphic data, derived primarily from questionnaires, on the career paths, interplay between personal and professional life, and practice styles of male and female physicians in the last fifteen years. Some social scientists consider these comparisons of primary importance. They emphasize, as some feminists have in the past, the issue of the comparative status of women within the profession as it now exists, with its emphasis on high pay, high technology and specialized, academic medicine. Many other pioneering women doctors, and present feminists, hope that the presence of women in medicine will change these priorities.

One body of literature documents the similarities and differences in career paths between men and women physicians. Women now practice in all the specialties of medicine but are more likely than men (68% vs 44%) to practice in primary care disciplines and less likely (10% vs 25%) to choose a surgical career. The field with the largest number of women physicians is internal medicine. Pediatrics and psychiatry have the second and third largest numbers of women practitioners (See Fig. 7).[14]

Women also work in different practice settings than men. In a trend consistent across virtually all medical specialties, women are more likely to work in salaried positions. In 1986, 52 percent of women physicians were self-employed, in contrast to 77 percent of their male colleagues.[15] Differences in time spent at work are narrowing, with women currently working the same number of weeks per year as men, although they average somewhat fewer hours per week (52.2 vs 58.2).[16]

Given the current reward system in medicine, the differences in income between men and women M.D.s reflect these different career paths. The average annual income of women physicians in 1986 was $73,100, in contrast to the $118,000 earned by men. However, the differences in practice patterns do not fully explain this income differential. Even after controlling for variables such as age, spe-

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14. Anne F. Crowley, Sylvia I. Etzel, and H.A. Shaw, "Graduate Medical Education in the United States," *JAMA*, 1987, 42:108–11.

15. On self-employed physicians, see W. L. Marder et al, "Physician Employment Patterns," *Health Affairs*, Winter 1988.

16. On hours of work per week, see W. L. Marder and S. L. Thran, "Medical Practice in the 1980s As Measured by the AMA Socioeconomic Monitoring System," Discussion Paper 87-7, Center for Health Policy Research, American Medical Association, 1987.

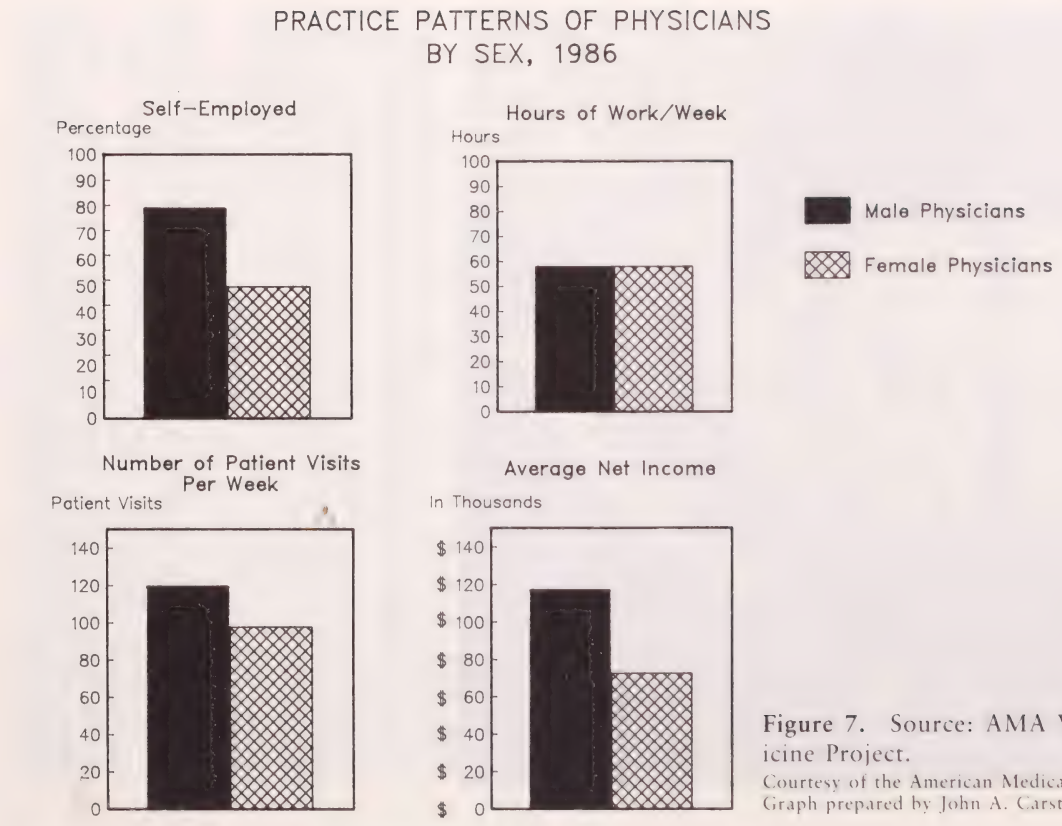

Figure 7. Source: AMA Women in Medicine Project.

Courtesy of the American Medical Association. Graph prepared by John A. Carstens.

cialty, years in practice, practice setting, and board certification, studies reveal that women physicians receive fifteen to twenty percent less income per patient visit and per hour than do men (See Fig. 8).[17]

Men and women physicians have different overall responsibilities in our society, which continues to assume that if women are married and have children, they will bear the burden of work in the home. Data on the personal lives of women reveal that compared to men, women physicians are more likely to be single or divorced, and less likely to have children. Roughly three-quarters of women physicians state that they are responsible for managing their households. For male physicians, wives provide the vast majority of child care, whereas husbands rarely care for the children of female physicians. Women physicians are far more likely than their male colleagues to state they changed career paths to accommodate conflicts between their personal and professional lives.[18] The interpretation of this data is difficult, because the studies are framed with a male model and the insistent ethos of our culture, especially our professional culture, that work life takes priority over personal life and the family.

The interpretation of studies of the relative effectiveness of male and female physicians is likewise unclear, because the very questions one asks depends on one's definition of effective medical care. These studies also reflect our cultural heritage in their belief that men and women are radically different. Earlier advocates of women in medicine, like Henry Hartshorne, argued that women physicians bring unique, humanistic qualities to the bedside. Historians have found evidence in patient care records at women's hospitals that women physicians provided a different style of health care.[19]

The word most often used in surveys of patients, nurses, and medical students to describe this difference is "empathic," suggesting

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17. On average net income after expenses and before taxes, see W. L. Marder and S. L. Thran, "Medical Practice in the 1980s as Measured by the AMA Socioeconomic Monitoring System," *Socioeconomic Characteristics of Medical Practice, 1988*, M. L. Gonzalez and D. W. Emmons, eds. (Chicago: American Medical Association, 1988).

18. Robert Arnold, Steven C. Martin, and Ruth M. Parker, "Careers of Women Physicians: Choices and Constraints," *Western Journal of Medicine*, 1988, *149*: 758–760.

19. Morantz-Sanchez, *Sympathy and Science*, Chapter 8.

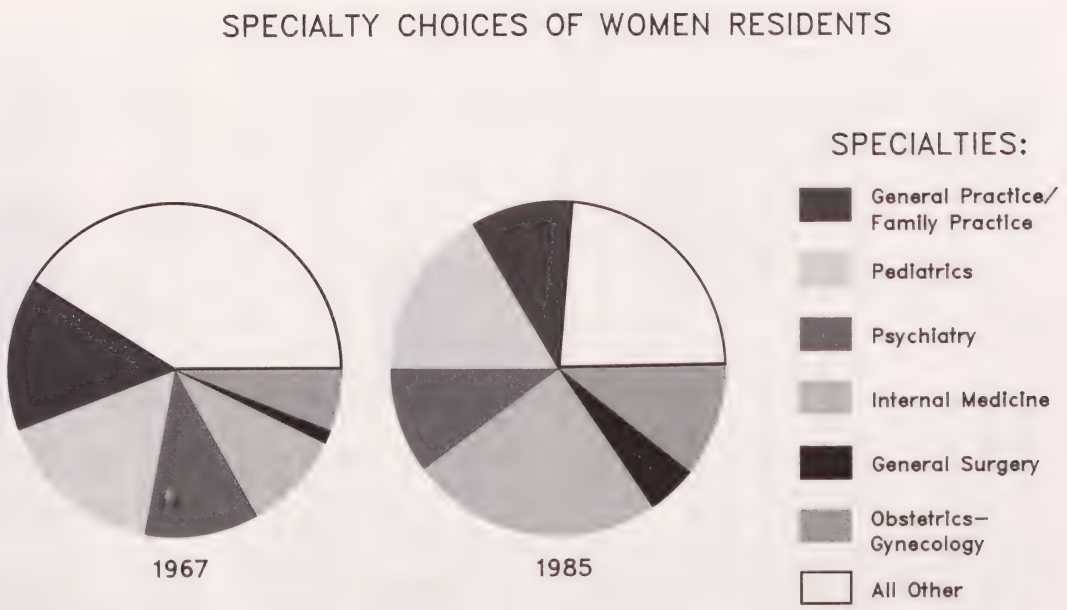

Figure 8. Source: Socioeconomic Monitoring System Report, 1987–1988.
Courtesy of the American Medical Association. Graph prepared by John A. Carstens.

that women more than men bring sensitive understanding of their patients to their medical practice. We close with some data that throws light on this perception.

Do men actually practice medicine differently from women? There is little evidence of gender differences in technical skills. Tests ordered, drugs prescribed, patient morbidity, and patient mortality all show no significant differences between men and women physicians. There is also little evidence that women physicians address psychosocial problems differently than their male counterparts.[20]

The attitudes of physicians towards patients might explain why women are perceived as more compassionate. Most studies, however, suggest that when women enter medical school they are more patient-oriented than men but, by the end of medical training, these differences attenuate or disappear. The difference that does not disappear is that of the physicians' attitudes towards "women's" issues — contraception, abortion, sex discrimination, women's health care — where women physicians consistently appear more sensitive to the concerns of women patients.[21] Overall, the magnitude of differences in attitudes towards patients appears insufficient to be the primary explanation for the widespread perception that men and women physicians practice differently.

Another explanation for the perceived sensitivity of women physicians is their communication style, which is characteristic of women in our society. Women physicians listen more, interrupt less, and share conversations more than men.[22] In contrast, men use more directed questions and emphatic speech to control the doctor-patient interaction . Women physicians spend more time with their patients and engage in more therapeutic listening and counselling (See Fig. 9).[23] This difference in style of communication between men and women physicians helps explain the perception that women

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20. S. Greer et al, "Responses of Male and Female Physicians to Medical Complaints and Male and Female Patients," *Journal of Family Practice*, 1986, *23*: 43–53; M. W. Bowman and S. H. Gehlbach, "Sex of Physician as a Determinant of Psychosocial Problem Recognition," *J. Fam. Pract.* 1980, *10*:655–59.

21. C.S. Weisman et al, "Abortion Attitudes and Performances Among Male and Female Obstetrician-Gynecologists," *Fam. Plan. Perspect.*, 1986, *18*:67–73.

22. C. West, "When the Doctor is a 'Lady'–Power, Status, and Gender in Physician/Patient Encounters," *Symbolic Interaction*, 1974, *7*:87–106; C. West, *Routine Complications* (Bloomington, Ind: Indiana University Press, 1985).

23. "Characteristics of Visits to Female and Male Physicians. The National Ambulatory Medical Care Survey, United States, 1977," *Vital Health Stat. [13] No. 49, 1980.*

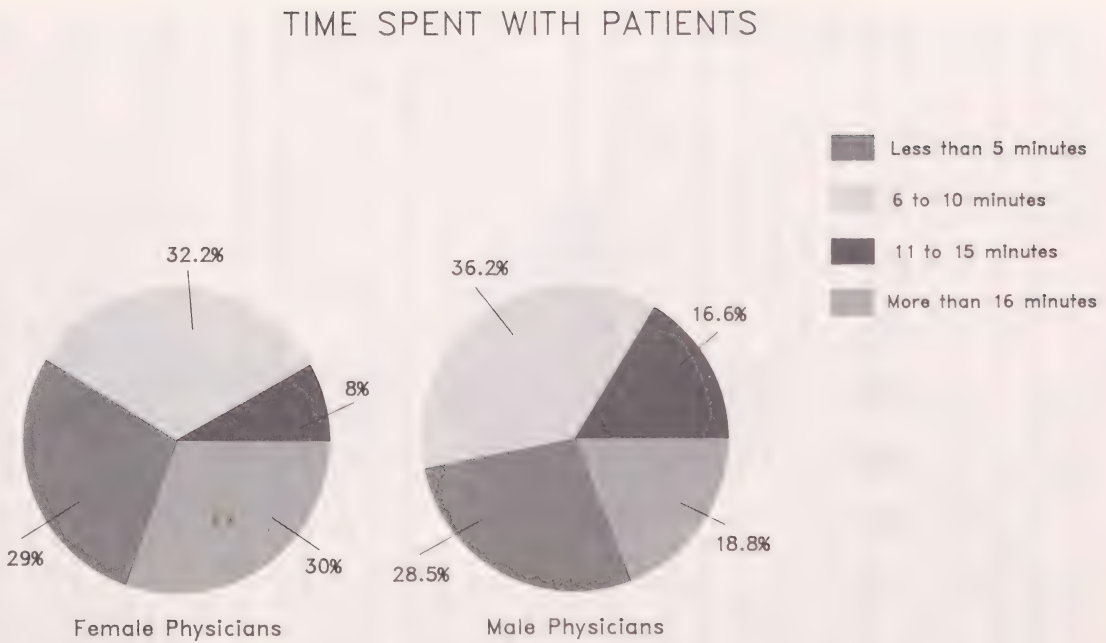

Figure 9. Source: The Department of Health and Human Services, The National Ambulatory Medical Care Survey, 1977. Graph prepared by John A. Carstens.

doctors are more empathic. It may also represent a model for more effective physician/patient communication.[24]

For one hundred years, men and women have looked forward to the skills and benefits that women would bring to the practice of American medicine. In this overview, we have emphasized the continuity of this hope, along with the persistence of social and cultural obstacles to women who sought and seek full equality as health care providers.

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24. Carol S. Weisman and Martha Ann Teitelbaum, "Physician-Gender and the Physician-Patient Relationship: Recent Evidence and Relevant Questions," *Social Science in Medicine*, 1985, *20*:1119–1127.

Report on the Benjamin and Mary Siddons Measey Foundation Workshop for Clinical Scholars, 1987–1988

STEVEN C. MARTIN

Introduction

From July, 1987, through March, 1988, three Clinical Scholars at the University of Pennsylvania — Robert M. Arnold, M.D., Steven C. Martin, M.D., and Ruth M. Parker, M.D. — met at the College of Physicians of Philadelphia on a regular basis with Diana E. Long, Ph.D., Director of the Francis Clark Wood Institute for the History of Medicine. As part of a College program on Women and Medicine funded by the Benjamin and Mary Siddons Measey Foundation, our focus was on women physicians. Beginning with an historical perspective and then drawing upon diverse disciplines including sociology, health services research, women's studies, and linguistics, we sought to define the current status of women in medicine, understand the forces that have determined this position, and suggest critical questions for further research. Our short term goals were to prepare an exhibit for the College celebration of Women's History Month and to present a seminar at the National Meeting of the Robert Wood Johnson Foundation Clinical Scholars Program. Our broader goals were to sharpen our abilities to investigate an important problem from a multidisciplinary perspective, to demonstrate how the social sciences offer important insights into both clinical and policy issues, and to gain practical experience in moving from an interesting question, through data accumulation and analysis, to oral presentation, and finally publication.

Background

The Robert Wood Johnson Foundation Clinical Scholars Program is a two-year program designed to assist physicians in their research with a serious interest in the non-biological aspects of medicine to develop expertise in these fields. There are currently six program sites: the University of Washington, Seattle; the University of California, Los Angeles; a combined program at the University of California, San Francisco and Stanford; University of North Car-

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olina, Chapel Hill; Yale University; and the University of Pennsylvania. Typically, Clinical Scholars are recent graduates of residency programs and they can be from any specialty.

Drs. Arnold, Martin, and Parker were Clinical Scholars at the University of Pennsylvania between 1986–1988. They are all internists. Dr. Arnold's research focuses on medical ethics and physician-patient communication. Dr. Martin is studying the history of nineteenth-and twentieth-century American medicine. Dr. Parker's primary research interests are health services research on the homeless and medical education.

While at the University of Pennsylvania, the scholars created their own programs. Drs. Arnold and Parker took formal course work in a variety of disciplines — including philosophy, law, sociology, anthropology, and history. Dr. Martin enrolled as a Ph.D. student in the Department of History and Sociology of Science. In addition, they remained clinically active as Fellows in the Section of General Medicine of the Department of Internal Medicine, supervising students and house staff, participating in journal clubs and research conferences, and providing direct patient care.

Past associations between the College of Physicians and the Clinical Scholars Program suggested that Diana Long would be an excellent person to help guide our research on women physicians. A former Wood Fellow and University of Pennsylvania Clinical Scholar, Joel Howell, M.D., suggested that the College of Physicians was a unique resource that we should utilize. The Benjamin and Mary Siddons Measey Foundation provided support for regular meetings of a College workshop on "Women and Medicine."

The Workshop and Its Outcome

Initially we read and discussed materials that provided us with a common background and knowledge base. We then developed a bibliography, using both published bibliographies and computer searches of appropriate databases. Each participant began to define an area of interest and began to read intensively in that area. The three areas we chose for our focus were: economics, the relationship between personal and professional life, and the practice styles of men and women physicians.

As the work progressed towards our presentation at the National Meeting for Clinical Scholars, we began to believe that it might be appropriate to present our research at additional meetings.

Through a network of contacts we were invited to address the Mid-Atlantic Regional Meeting of the American Medical Students Association. A proposal to present a symposium at the Mid-Atlantic Regional Meeting of the Society of General Internal Medicine was accepted. To prepare for these meetings we presented to the General Medicine Research Conference where we received useful comments and critiques. Acting on a suggestion of Dr. Long, we also contacted Regina Morantz-Sanchez, Ph.D., Professor of History at U.C.L.A., and author of *Sympathy and Sciences: Women Physicians in American Medicine*. She accepted our invitation to participate in our session at the Clinical Scholars' National Meeting and at the Society of General Medicine Meeting. Professor Morantz-Sanchez's participation and comments strengthened our own presentations and helped deepen our understanding of the issues.

The Workshop planned two activities at the College of Physicians. First, the Clinical Scholars presented their results at one of the weekly seminars run by the Wood Institute. Second, the Workshop prepared their exhibit on women and medicine as part of the College's celebration of Women's History Month (March 1988). The themes and some of the materials from that exhibit are described in the article above.

The fruits of the collaboration between the Clinical Scholars and the College are evident in three publications by the Scholars. The first two, "Careers of Women Physicians: Choices and Constraints" and "Taking Care of Patients: Does it Matter When the Doctor is a Woman?," were published in a special issue of the *Western Journal of Medicine*, guest edited by Linda Clever in December, 1988. In addition, we published "Gender and Medical Socialization" in the December, 1988 issue of the *Journal of Health and Social Behavior*.

Conclusion

The Measey Foundation workshop at the College of Physicians of Philadelphia was extraordinarily productive and we hope that further interactions between Clinical Scholars and The College of Physicians of Philadelphia are actively encouraged. The synergism

between these Philadelphia institutions is certain to promote interesting and important research.

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Acceptance of the Seventh Annual Award of the American Civil Liberties Foundation of Pennsylvania

EMILY HARTSHORNE MUDD

I long ago learned, from Dr. Abraham Stone, that compliments are like perfume; they are very pleasant to inhale, but one should never swallow them.

Dr. Stone was a pioneer in sex research, which can mean different things to different people. Consider, for example, our friend who was attending a meeting about computers. The leader of the group pointed to a large chart. "These tables," he said, "are broken down by sex and age." One of the men listening raised his hand. "Did you say these tables are broken down by sex and age? My question is 'Who isn't?' "

In accepting this very unique and welcome honor from the American Civil Liberties Union (ACLU), with deep appreciation, I have to confess, along with Burt Lancaster, that happily, I have been a card carrying member of the ACLU for eighteen years.

My first thought of asking help from this group came in 1927, when five of us hoped to open the first birth control clinic in Pennsylvania, at 69th Street in Delaware County. Birth control was then listed in the Obscenity Act in Pennsylvania. It was completely illegal; even a request to a doctor for assistance was illegal. A courageous physician, Dr. Victor Janvier, volunteered to serve at the opening clinic, but no nurse was available. Because of the illegality, many nurses and doctors were afraid of losing their livelihood if they took part.

Wondering what best to do next, I began looking over the laws of the Commonwealth of Pennsylvania and found two that interested me. One said that it was illegal for two people on bicycles to ride abreast down Chestnut Street. Think of the traffic hazard! The other, more helpful to our cause, stated that a pregnant woman could not be incarcerated. Fortunately, I was obviously pregnant at that time, so I immediately volunteered to help Dr. Janvier at the first clinic session. We expected to be arrested. My hope was that the ACLU would get me out of jail! Actually, they didn't have to, because no official closed the clinic, then or later.

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It is clear that overpopulation is the most immediately pressing national and world problem. A few Western countries are currently successful in stabilizing their birth rates. Many New World countries are not equipped or not willing to do so. And now, our own national government, including our own state government in Pennsylvania, is attempting to make methods of child spacing and pregnancy control illegal once again. What a fabulous job the ACLU is doing to combat them! I am sure they will continue to do so.

The well known expert on population, Paul Ehrlich, has taught us that overpopulation is measured by the consequences human activities have on a community. We are all overwhelmed by the predictions for a disastrous future that will result from our present abuse of the environment; from our sewage disposal, water and ocean pollution, toxins, acid rain, and the Green House Effect.

Many of you, and friends everywhere, are tackling these horrific problems with an initial success. Such efforts will have to cut through the philosophy of the "I" world, so conspicuous in our United States and the West; this claim that what is important is *me*, *my* success, *my* superiority over my neighbor, *my* business associates. In other words, what can the world do for *me*? Will the rules of American life continue to be dictated by Wall Street?

We are beginning to learn that everything is interwoven with everything else. The "I's" can survive only if their actions are involved with others in the overall needs for survival of our one world. Such efforts require intergroup cooperation in local districts, in cities, and even in a community beyond national or international boundaries.

In addition, the many recent changes in our high efficiency technology have initiated and will instigate intensive reconsideration of our ethics in the fields of medical care, business dealings, voluntary associations, government procedures and perhaps in our laws. The ACLU is already, and will continue to be, intensely involved in these changes!

We need both facts and inspiration. It is said of a recent President of our United States, that he was so full of convictions, he had no time for the facts. Perhaps this applies to many of us. We must decide whether the most serious obstacle to progressive change resides in the White House or in our own minds. An image of something is not a fact—it is a reflection.

Emily H. Mudd, Ph.D. visiting the Kinsey Institute for Sex Research in 1952, as consultant for W. B. Saunders, Philadelphia publisher of Alfred Kinsey et al, *Sexual Behavior in the Human Female*, 1953. Courtesy of Emily H. Mudd, Ph.D.

We're so engaged in doing things to achieve purposes of outer value, that we forget the inner value, the rapture that is associated with the experience of being alive.

Some of us have recently been exposed to *The Power of Myth* by Joseph Campbell—an inspiring experience. I highly recommend his book, recently co-authored with Bill Moyers. It exemplifies so clearly what we have all felt at times, that "the influence of a vital person, vitalizes people around them" as Joseph Campbell puts it. "We are at this moment [in 1988–1989] participating in one of the

very greatest leaps of the human spirit to a knowledge not only of outside nature, but also of our own deep inward mystery."[1]

So, where do we go from here? I, for one, believe that we will be forced to focus on survival rather than destruction. A great French historian wrote in 1895, "Pessimism is nothing but a state of mind, whereas optimism is a system — the finest and most philosophical invention of the human mind." I believe that some of us, hopefully many of us, are still optimistic, in spite of the turmoil and dangers of our days.

In accepting this award from the ACLU, I must express my heartfelt thanks to my husband, Fred Gloeckner, for his loyal kindness; to the six members of my family, who have come from Washington, Boston, and Milwaukee; to the four members here of my cherished extended family; to Nancy and Thatcher Longstreth who, as far as I know, have never before graced an ACLU dinner. My appreciation and greetings to my many other friends, associates and fellow card holders. Especially, I see my long time friend and ally, Judge Nochem Winnet, who chaired the Legal Supervisory Committee for Marriage Council back about 1938, when we were accused of running an abortion clinic. And most sincerely, I thank the officers, staff and wonderful volunteers of the ACLF of Pennsylvania for making this unique evening possible.

If you will forgive me for being a bit sentimental, in closing may I leave with you a favorite quotation said to be from Fra Giovanni, written in 1531 in a letter to her husband. "I salute you," she wrote. "There is nothing I can give you, which you have not; but there is much that, while I cannot give, you can take. Take heaven. No peace lies in the future which is not hidden in this present instant. Take peace. The gloom of the world is but a shadow, behind it, yet within reach is joy. Take joy." And so she concludes, "I greet you with this hope, that for you (and all of us), now and forever, the day breaks, and the shadows flee away."

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1. Joseph Campbell and Bill Moyers, *The Power of Myth* (New York: Doubleday, 1988), p. xviii.

Reviews

ARTHUR KLEINMAN. *The Illness Narratives: Suffering, Healing, and the Human Condition*. 284 pp. New York: Basic Books, 1988. Price $19.95.

HOWARD BRODY. *Stories of Sickness*. 210 pp. New Haven: Yale University Press, 1987. Price $27.50.

Reviewed by JULIA L. EPSTEIN

The disjunction between a patient's experience of illness and a physician's professional discourse of disease forms a problem that has been receiving increasing attention. The biomedical explanatory model of disease addresses itself to pathological processes in the body; the human narrative of suffering focuses on lived experience in a psychosocial context. When patients seek medical consultation, they are looking for a coherent synthesis of this disjunction that can integrate biomedical explanation into the fabric of their lives. The restoration of health entails a negotiation between patient and clinical practitioner for a single explanatory story encompassing their mutual understandings of bodily changes.

Arthur Kleinman, a psychiatrist and professor of anthropology at Harvard University, has been a pioneer investigator of the cultural ramifications of health care systems. His recent book, *The Illness Narratives,* examines the problems faced by patients and clinicians in the treatment of chronic illness. These patients — diabetics, asthmatics, chronic pain patients, hypochondriacs, patients with physical and cognitive disabilities — present the health care system as it currently operates with a series of problems: they do not get well, and both patients and practitioners become frustrated with the multiple difficulties their care entails. Kleinman argues that the nature of medical education and postgraduate training militates against any amelioration of this cycle of frustration, and proposes radical change based on ethnographic and psychosocial approaches to treatment. These changes could, he claims, make it possible to practice a more humane medicine. His ideal is to train clinicians as participants in the patient's experience of illness.

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Kleinman's premises are cultural. Notions of health and illness and of bodily experience are mediated, in his view, by social relations and cultural values that determine how individuals categorize their symptoms. Kleinman makes key use of the distinction between disease, a specific and biomedical entity, and illness, an experiential category. The clinician, in this scheme, transforms illness into a technical disorder. If that is all the clinician does, argues Kleinman, the patient is robbed of the plural social meanings of illness. In addition to diagnostic sleuthing, the physician needs also to decode the patient's interpretation of symptoms. Physicians must therefore practice ethnography, biography, and psychotherapy in addition to technical medicine if the patient is to be cared for humanely.

The Illness Narratives is organized largely around case histories. The book opens with two chapters that outline Kleinman's notion of the difference between illness experience and biomedical explanation. Eleven chapters focus on particular patients and form the core of the analysis. A chapter on types of physician experience presents case studies of doctors with varying degrees of success and fulfillment who treat patients with chronic illness. The final two chapters discuss possibilities for bringing Kleinman's ideal of moral witnessing and narrative participation into a radically revamped health care system.

The clinician, according to Kleinman, must assemble the patient's illness narrative, the story the patient tells to explain a long-term course of illness. "The meanings of chronic illness," Kleinman writes, "are created by the sick person and his or her circle to make over a wild, disordered *natural* occurrence into a more or less domesticated, mythologized, ritually controlled, therefore *cultural* experience" (p. 48). The clinician also brings cultural biases to an understanding of illness and health; both patient and physician must unpack their particular and idiosyncratic narratives to realize the overdetermined nature of chronic illness and begin to make therapeutic progress. The "brute materiality of disordered biological processes" operates in dialectic with cultural categories and personal significations (p. 55).

In the biomedical model, clinicians seek the standard and pathognomonic manifestations of disease processes in order to diagnose bodily changes within certain preformed categories. Kleinman's central idea is that no two people experience the same disease in the same way, and that individuals must be treated within the context of their experience, their family life, their work world, their ethnic-

ity and cultural situation. Clinicians can help their patients by providing them with remoralization, a process that requires what Kleinman calls "authentic witnessing," a moral category of human health care that he feels is not served by the medical establishment (p. 97).

The witnessing process begins with interviewing and listening skills, and continues with the record of a patient's history that functions as a mini-ethnography. Meant to complement "the standard biomedical approach to the treatment of disease processes," this system produces a "practical clinical methodology" that Kleinman summarizes as "*empathic listening, translation,* and *interpretation*" (p. 228). While Kleinman is persuasive in his contention that "the experience and meanings of illness are at the center of clinical practice" (p. 253), he does not adequately grapple with the logistics and, especially, the economics of such radical change even as the production of a full life history account in patient records. He refers to the complex relationships among physicians in various specialties, and between physicians, nurses, therapists, social workers, technicians, and support staff, without providing a satisfactory critique of existing personnel structures. These problems, from a very different perspective, were analyzed in Paul Starr's important book *The Social Transformation of American Medicine* (New York: Basic Books, 1982). To ask Kleinman to solve all the problems he has identified, however, may be expecting too much of an otherwise provocative analysis.

Howard Brody's *Stories of Sickness* argues a similar case. Brody understands medicine to be a storytelling enterprise that requires a kind of poeisis or literary interpretation to practice, and sees the physician as caught between the need to categorize disease within standard typologies and the need to read each patient's story as unique. However, while Kleinman argues this case with specificity and detailed investigations of particular patients, their treatments, and the implications of patients' and practitioners' experience for human health care, Brody's book seems haphazardly organized, and is often a diffuse compilation of the work of others. Its intersections of patient examples with readings of literary works from Kafka's *Metamorphosis,* Thomas Mann's *Magic Mountain,* and Solzhenitsyn's *Cancer Ward* to Sophocles' *Philoctetes* and poetry by James Dickey lean so heavily on the literary potential of illness that the implications for health care remain unfocused.

Brody argues, as does Kleinman, that patients' narratives serve therapeutic functions. *Stories of Sickness*, however, fails in more than its fragmented organizational schema. Brody does not distinguish between the interpretation of a narrative by Chekhov or Tolstoy and the interpretation of a patient's story. This naive neglect of literary art undermines his argument. More seriously, and despite the fact that the book closes with a discussion of relational and decisional ethics, Brody begs ethical questions throughout his discussions of life stories, treating patients in persistent vegetative state and those with severe brain injury, for example, as non-persons (pp. 47–48). Newborns and the elderly are also dismissed simplistically. One wants to remind Brody that even incoherent and incomplete narratives have meaning; disability and disease can disturb narrative expectations, but they cannot render lives entirely meaningless.

Investigations of health care systems in cross-cultural perspective, analyses of the nature and function of medical discourse, and the nascent academic discipline of literature and medicine all point to a welcome interest in the way medical knowledge evolves and is codified. The concern with narrative in *The Illness Narratives* and *Stories of Sickness* returns us to the original Greek understanding of the diagnostic process as a problem in semiology, a reading of the patient's history as a multivocal structure of symptoms and signs that cannot be detached from the life experience of the patient.

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SUSAN REVERBY. *Ordered to Care: The Dilemma of American Nursing, 1850–1945*. 320 pp. New York: Cambridge University Press, 1987. Price $44.50

Reviewed by CLAIRE M. FAGIN

Reverby's *Ordered to Care: the Dilemma of American Nursing, 1850–1945* provides a fascinating if somewhat depressing historical perspective on current efforts to reform nursing in the interests of its practitioners. The reader cannot help but learn, from this complicated social history, the overwhelming obstacles that nurses found to their professional development, and their resilience in the pursuit of this goal.

Reverby organizes her discussion in three parts: the nurse and the hospital before training; the trained nurse; and the reform of nursing. Issues of current political interest, pursued throughout the book, include nurses' desire for collaboration rather than confrontation with hospitals and physicians, the inability of nurses to unite in the face of oppression because of their class division, nursing leadership's belief in the power of documentation as a force for change, and nurses' love affair with the new "science" of efficiency.

The book succeeds in covering these issues in depth but it never quite captures the importance of any of them in a thematically unified whole. The book is a developmental history of nursing from the time of its invention in the United States in the wake of the Civil War, to its decline in the decades before World War II. After that war, federal money began pouring into the health care delivery and education systems and nurses began to break out of the bondage of hospitals.

Reverby's book shows that, in spite of these changes, the issues which now provoke nurses — and their supporters, detractors, and scholars — have a long history. The author discusses, with her characteristic sensitivity and objectivity, physician-nurse collaboration, hierarchical conflicts, autonomy, oppression of nursing students, diversity of the nursing population and of training schools, and nursing's alliance with management and efficiency.

Nursing's collaborative relationship with medicine is of particular interest to me. Despite the fact that there are few instances in which physicians have genuinely cooperated with nurses as equals in the last one hundred years, most nurses still are enchanted with collaboration and become quite anxious when a more confrontational mode is suggested. Reverby shows that nurses have always been interested in the notion of collaboration as they addressed the problems of patients and nursing's professional development. The obstacles to such cooperation were clear from the beginning of organized nursing. Reverby tells us that physicians believed nurses "were supposed to defer to their authority and to keep the institution orderly and clean. Physicians, the matrons and nurses thought, were to be reasonable in their demands, gentlemanly, and responsible for the patients under their care" (pp. 31–32) . . . "The physicians resented, . . . any initiatives taken by the nurses, even when the physicians themselves were clearly either at fault or being unreasonable" (p. 32).

Despite these conflicts, there was recognition on the part of some physicians ". . . that a nurse with excellent observation skills and the willingness to report honestly on all she saw was of critical importance to a patient's recovery" (p. 33). However there was also the historical antecedent of what some have called the "doctor-nurse game." Reverby describes the appearance of compliance and rituals of deference with physicians and trustees, while on a day-to-day level nurses opposed being controlled and used the hospital's authority structure to their individual and group advantage.

Reverby shows us that the so-called "training schools" were established to make the women trainees passive while exploiting their labor. The training schools supplied a superb solution to the staff shortages faced by an increasing number of hospitals. Such schools offered a cheap and abundant supply of labor. Because young women thought they were entering a training school rather than an indentured life, they came willingly and applied for the privilege. Indeed for some it was a means of upward mobility and an escape from another form of slavery, domestic service. The planned turnover of students worked to the hospital's advantage in what I see as a system of institutional slavery. With a student group, hospitals were assured dedicated uncomplaining "slaves" who did not stay with the "owner" long enough to become troublesome, rebellious, or slack. Most of the young women involved were eager to complete their "training" despite a high incidence of illnesses such as typhoid, scarlet fever, pneumonia, diphtheria, and tuberculosis linked to high morbidity and mortality rates.

However, by the early part of the twentieth century, some nurses saw that the nursing school was equivalent to a reformatory, offering urban young women more limitations than opportunities. Reverby tells us that as early as 1907 nurses in Boston told a reporter ". . . a woman would be better advised to take up teaching or stenography. Nursing, they declared, is not what it is 'cracked up' to be" (p. 90).

The nursing superintendents were unable to act as advocates for nursing, nurse training, or the nurses themselves. Their pleas to boards of trustees fell on "ears more closely attuned to arguments made by doctors in the name of science and medical care" (p. 76). The turnover rate among nursing superintendents was high because of their frustration and the level of conflict with hospital administrators and physicians. Reverby tells us that "[T]hree quarters of the 1440 superintendents surveyed by the Grading Committee had

stayed in their current positions five years or less" (p. 106). A recent study indicates a similar longevity for directors of nursing.[1]

Ordered to Care does not limit its story to the oppression of nurses, and Reverby helps us to understand nurses' struggle for a vision of nursing as autonomous and professional. However nursing "could not gain professional control while the hospitals' needs still governed entry into training and the nursing education process. Educational improvements were continually fought by physicians who wanted the nurse to be merely a kindly woman and a practically trained subordinate" (p. 143).

One strategy nurses tried was to ally themselves with the scientific management, or efficiency, movement. It is particularly interesting that Frank Gilbreth, one of the leaders in the scientific management movement presented his ideas to a national nursing group before appearing at hospital and medical meetings. "After Frank's death in 1924, Lillian Gilbreth continued to work for various nursing groups for the next thirty years" (p. 151). Leaders hoped that the introduction of efficiency and scientific management theory could end the drudgery for nurses, increase the time they could spend with patients, and upgrade nursing education. Instead, the benefits of this movement accrued primarily to the hospitals.

Other strategies included the encouragement of study groups, composed of nurses, planners, health economists, sociologists, educators and physicians. Reverby discusses two major reports, *The Goldmark Report* (1923) and *Nurses, Patients and Pocketbooks* (1932). These reports dealt with upgrading basic and post graduate nursing education, replacing student nurses by graduates in hospitals, reducing the number of schools, and securing public funds of nursing education. *The Goldmark Report* also recommended the endowment of a university based school to train the profession's future leadership.

To any nursing educator, the results of these studies have to be viewed as a "pyrrhic victory" because of the seeming impossibility of getting the political clout behind these recommendations. Reverby describes nursing's hopes that the Goldmark study, funded by the Rockefeller Foundation as the first major national study on nursing, would do for nursing what the Flexner Report had done for medicine. Unlike the Flexner Report, however, where massive

1. Claire M. Fagin and Cynthia Freund, "Firings, Unhappiness Main Reasons for Job Shifts by Nurse Heads," *Modern Healthcare*, 1984, *13*:95–96.

support of the Rockefeller and Carnegie foundations turned the recommendations into reality, only minimal funds from Rockefeller followed, and even these were somehow subverted by Yale officials.

In the case of *Nurses, Patients and Pocketbooks*, both the American Medical Association and the American Hospital Association were extremely negative towards the findings. Nursing's hopes for collaboration with the AMA and AHA and it's unwillingness to openly challenge these strong groups who derided the recommendations and opposed change caused a stall in progress. *Ordered to Care* does not give systematic attention to "caring," that elusive quality that attracts people to nursing and then binds them to the field, in spite of its hardships. The introductory and concluding sections of Reverby's book, however, describe the paradox of attempting to nurse in a society which systematically undervalues sensitive attention to others. The last chapter provides an excellent summary of the past, present, and future importance of caring that summarizes the major social theme of the book. In Reverby's words, "The nature of the nursing experience . . . suggests the constraints on a liberal political effort to address the problems of caring." She urges us to create ". . . the conditions under which it is possible to value caring and to understand that the empowerment of others does not have to involve self-immolation. To achieve this, nurses will have to create a new political understanding for the basis of caring and find ways to gain the power to implement it" (p. 207).

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New Books in the History of Medicine in the Historical Collections of the Library

January through March 1989

JACK ECKERT

Vern L. Bullough, Olga Maranjian Church, and Alice P. Stein, *American Nursing: a Biographical Dictionary* (Garland Publishing, 1988).

J. T. H. Connor, compiler, *The Artifacts and Technology of the Health Sciences: a Bibliographic Guide to Historical Sources* (University Hospital: London, Canada, 1987).

Norman Gevitz, editor, *Other Healers: Unorthodox Medicine in America* (The Johns Hopkins University Press, 1988).

Sue M. Goldie, editor, *"I Have Done My Duty": Florence Nightingale in the Crimean War, 1854–1856* (University of Iowa Press, 1987).

F. G. Gosling, *Before Freud: Neurasthenia and the American Medical Community, 1870–1910* (University of Illinois Press, 1987).

Carl W. Gottschalk, Robert W. Berliner, and Gerhard H. Giebisch, editors, *Renal Physiology: People and Ideas* (American Physiological Society, 1987).

Sydney A. Halpern, *American Pediatrics: the Social Dynamics of Professionalism, 1880–1980* (University of California Press, 1988).

Lisabeth M. Holloway, *A Fast Pace Forward: Chronicles of American Podiatry* (Pennsylvania College of Podiatric Medicine, 1987).

Russell C. Maulitz and Diana E. Long, editors, *Grand Rounds: 100 Years of Internal Medicine* (University of Pennsylvania Press, 1988).

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Sherwin B. Nuland, *Doctors: the Biography of Medicine* (Alfred A. Knopf, Inc., 1988).

Phinizy Spalding, *The History of the Medical College of Georgia* (The University of Georgia Press, 1987).

Memoir of Esmond R. Long, 1890–1979

PETER C. NOWELL, M.D.
LOUIS B. DELPINO

Esmond Long died on 1 November 1979, at the age of eighty-nine. He successfully combined a taste for literature and history with a scientific career in experimental pathology that spanned more than fifty years. Besides making major contributions to research on mycobacterial infections, he wrote extensively on the history of medicine, biomedical research, and pathology. He was a member of the College of Physicians for forty-six years, active in maintaining the Mütter Museum and the Abbé Cabinet, and published at least five papers of medical history and memoirs in the *Transactions*.

Esmond Ray Long, known as "Es" to his colleagues, was born on 16 June 1890, in Chicago. His father, John Harper Long, was a professor of Chemistry at Northwestern University and, from 1913 until a year before his death in 1918, dean of Northwestern's school of pharmacy.

Long majored in chemistry at the University of Chicago, where he received his A.B. degree in 1911. His Ph.D., from the University's school of medicine, was awarded in 1919, and in 1926 Long took his M.D. degree from the Rush Medical College, then a part of the University.

This delay between degrees was due to pulmonary tuberculosis whose onset came in 1913. Long had had no previous indications of ill health, and in fact had been a member of the track team in his premedical days at the University. One day during his second year as a medical student, however, he coughed up blood while playing tennis. That night, back in the laboratory, he stained his sputum and found it to contain tubercle bacilli.

During the next five years, Long underwent several forms of tuberculosis therapy fashionable at the time: dry-air treatments, exercise programs, bed rest, and a cholesterol-rich dietary regimen that might typically include a gallon of milk and a dozen eggs daily, along with three regular meals.

Long kept abreast of scientific literature and even did some laboratory work throughout his illness. In 1918 he worked at the

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renowned tuberculosis center in Saranac Lake, New York, assisting in the laboratory of the center's director, Edward R. Baldwin, a noteworthy successor of Edward Livingston Trudeau.

With Baldwin's encouragement, and with help from the staff, Long extended some initial research he had done in Seattle, during an earlier phase of his tuberculosis cure. He learned to culture and isolate the tubercle bacillus from patients and laboratory animals, and to follow the course of the disease in guinea pigs and rabbits. He also examined specimens for local physicians, and gained practical experience in patient management, as well as in the theoretical and laboratory aspects of tuberculosis.

Long became acquainted with several others who were investigating the same or similar problems at Saranac, and from each he learned something. Perhaps the most influential of these relationships was with Allen K. Krause, a graduate of the tuberculosis center's school of treatment research, of whom Long wrote: "Krause pushed forward the researches of Trudeau and Baldwin and developed a concept of tuberculosis that dominated American views of its pathogenesis for years, only to give way in time to more advanced concepts promulgated by others." Long consciously patterned his own prose style after that of Krause, whom he considered "a highly gifted writer and speaker, with an encyclopedic mind and prodigious memory of the literature on tuberculosis."

Long recovered sufficiently to return to Chicago in 1919. He resumed his research, on purine metabolism, under Dr. H. Gideon Wells, a leader in what was then called "chemical pathology." Long had originally been a chemical assistant to Wells in 1911. Recalling his initial association with his mentor, and the tiny laboratory he had shared with Wells and another assistant, Long wrote: "Wells was only thirty-six, but seemed old to me—and I have been grateful ever since for the intimacy of our crowded room. We became closely acquainted without losing the relation of master and pupil."

After receiving his Ph.D. degree, Long taught pathology to second-year medical students while continuing towards his own M.D. degree. Throughout this demanding period, which entailed both day and night autopsies at funeral homes and hospitals, he continued his laboratory research and his studies of medical history.

Long spent the summer of 1921 in clinical study at the Stanford University Medical School. In September, on his way home to Chicago, he visited Denver to renew his acquaintanceship with a distant relative, Marian Beak Adams, with whom he shared great-great

grandparents. Esmond Long and Marian Adams were married in June of the following year. Shortly afterwards they sailed for Prague, Czechoslovakia, for a somewhat unconventional honeymoon.

Long spent six months with Anton Ghon at the German University in Prague. Ghon, who was renowned for his work on the primary complex of tuberculosis and its relation to the allergy associated with the disease, encouraged Long's study of the pathologic lesions of primary tuberculosis infection. Long translated several of Ghon's papers into English, and their friendship lasted until Ghon's death—ironically, of tuberculosis—in 1936.

In 1923 Long resumed his interrupted Chicago research, focusing on the nature of the active principle of tuberculin (extracts of the tubercle bacillus and the medium in which it was grown) and of the inflammatory reactions to tuberculin in normal and tuberculous subjects. His interest in the heightened responses to tuberculin in a specific cell, the spermatocyte, led to the development of the *spermatocyte test.*

Koch had been the first to observe, in 1901, that tuberculin was toxic for tuberculous guinea pigs and non-toxic for non-tuberculous animals. As a diagnostic reagent, tuberculin injected into tuberculous humans caused inflammation but did not affect healthy subjects. Long had observed that whether or not necrosis occurred in tissues injected with tuberculin depended on several factors. In skin, for example, necrosis occurred only with large doses, whereas in the testes of tuberculous guinea pigs, but not those of healthy animals, tuberculin produced a severe reaction characterized by the coagulation of spermatocytes.

"There can be no question," Long wrote, "that the reaction just described is the true tuberculin reaction. It is absolutely specific." He noted that "preparations of bacteria other than the tubercle bacillus (and other acid-fast bacilli), of which several have been injected, do not elicit the reaction," and that "the type of reaction is histologically identical with that observed in the skin reaction, except that degeneration and necrosis are more pronounced."[1] The spermatocyte test, confirmed by at least a hundred experiments in Long's laboratory, had several other advantages. It could detect one-tenth of the minimum quantity detectable by the skin test, reactions

1. Esmond R. Long, "Standardization of Tuberculin," *Journal of Infectious Diseases,* 1925, *37*:368–384.

were more constant, and microscopic sections of testes could be preserved as a permanent record of any test.

Meanwhile, Long continued his investigations into the active principle of tuberculin. In collaboration with Dr. Florence Seibert, who was his chemical assistant, he showed the active principle to be a protein. These findings were published in *The American Review of Tuberculosis* in 1926, and in 1932 Long received the Trudeau Medal of the National Tuberculosis Association for his discovery.

In 1923 the first edition of *The Chemistry of Tuberculosis*, coauthored by Long, H. Gideon Wells, and L. M. DeWitt, was published. Long's *History of Pathology* appeared in 1928, the year he attained the rank of professor, and the following year saw publication of his *Selected Readings in Pathology from Hippocrates to Virchow*. During this busy period, and until 1950, Long also served as special medical editor for *Webster's International Dictionary*, defining or approving the definitions of some 15,000 words.

In 1932 Long moved with his family to Philadelphia, where he became a professor of pathology at the University of Pennsylvania and the director of laboratories at the Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis, a department of the university. He continued his collaboration with Dr. Florence Seibert, who eventually succeeded in crystallizing and purifying the active principle of tuberculin. The resultant substance, known as purified protein derivative (PPD), became a U.S. Public Health Service standard dermal reactivity indicator for diagnosing tuberculosis, and in 1952 was adopted as the international standard by the World Health Organization.

From 1935 until his retirement in 1955, Long was director of the Phipps Institute. Much of the research at Phipps involved environmental factors and racial differences in tuberculosis. To this demographic base Long added his knowledge of metabolic and anatomic aspects of the disease, thereby achieving a synthesis of the pathology of active tuberculosis with its epidemiology. This enhanced expertise led to Long's appointment as a consultant to the U.S. Army Medical Corps, as a lieutenant-colonel, during the Second World War. He also served as a deputy chief for the Office of the Surgeon General, with responsibilities involving the medical care of recruits, hospital policies, and other tuberculosis-related programs. Following the War, Long shifted his attention to the treatment and prevention of tuberculosis among the population of Germany. These combined experiences resulted in numerous pub-

lications, including a definitive text, *Tuberculosis in the Army of the United States,* co-authored with Seymour Jablon.

From 1932 until 1948, Long was a member of the Advisory Medical Board of the Leonard Wood Memorial of the American Leprosy Foundation. His responsibilities included directing experiments on the separation of leprosy bacilli from infected tissues. Despite his general interest in mycobacteria, this was his first major involvement with leprosy, a field in which he later earned considerable distinction.

In 1964 Long was elected editor of the *International Journal of Leprosy,* succeeding Dr. H. W. Wade, who had held the position since the journal's inception more than three decades earlier. The journal was a year behind in publication, but Long brought it up to date. He often traveled by train or drove the two hundred miles between his editorial office at the Leonard Wood Memorial and his home, in Pedlar Mills, Virginia. In winter months, when travel was uncertain, he and Mrs. Long closed their home and lived in Washington, D.C. at their own expense.

Long was mindful of the dependence of progress in leprosy research on advances in the study of numerous other mycobacterial disorders, for example Johne's disease, a deadly enteritis afflicting cattle, sheep, and goats. This moved him to propose a broader coverage by the journal, and the expanded title *International Journal of Leprosy and Other Mycobacterial Diseases* headed the first issue of volume thirty-six in 1966.

That same year the Longs returned permanently to Philadelphia. Despite his "academic retirement," Esmond remained active in pursing his scientific interests. In 1970 he renewed his old friendship with Dr. E. Freerksen, of the Borstel Research Institute in Germany, whom he had helped to develop a tuberculosis research program during the war. Freerksen hoped that the *International Journal of Leprosy* would publish the proceedings of a colloquium on leprosy research to be held at Borstel that August, with Long as editor of the volume.

Long accepted the responsibility, which proved tedious even for his customarily swift editorial talents. The colloquium comprised seventy-five papers and talks, many given informally with slides. Rearranging this material to comply with the journal format, as well as coping with peculiarities of language, took some eight hundred hours. Nevertheless, the proceedings were published as a well-illustrated, easily read book of almost five hundred pages,

entitled *Leprosy Today* and published in 1972 as a supplement to the journal.

Long's own publications during this period extended his fifty years of interest in mycobacterial diseases and in the history of medicine. He wrote accounts of a number of scientific organizations, including a history of the Pathology Department at the University of Pennsylvania, which was his last work, published in 1976. He was a member of some twenty scientific societies and president of at least six. His prolific writing over more than half a century included nearly three hundred articles and editorials, and twelve books. He also gave at least twenty special lectures and edited three scientific journals.

This brief listing of accomplishments indicates the enormous contributions made by Esmond Long, but does little to convey the genuine humanity, kindness, and humility of the man. These qualities, evidenced throughout his life, were apparent even to those who met him only in his later years.

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Jerry Zaslow, 1918–1987

ROBERT S. PRESSMAN

Jerry Zaslow, a Fellow of the College since 1957 and a past President of the Philadelphia County Medical Society, died suddenly in his home in Elkins Park on the afternoon of 8 December 1987. Jerry was a devoted public servant to the practice of medicine, yet an intensely private person. He had a ready smile, a jovial mien, and he was a willing and engaging conversationalist. His devotion to organized medicine was legendary. He willingly assumed any task that would further the cause of the private practice of medicine. He was a forceful and compelling speaker with a vast array of salient information at his fingertips. Because of his legal training, he was fully conversant with the intricacies of governmental legislation that increasingly hemmed in the practitioner of the healing arts.

His worth was widely recognized. Zaslow was one of the dominant figures in the Philadelphia County Medical Society and in the Pennsylvania Medical Society. Whenever he rose to speak on the floor of the House of Delegates, a hush would come over the audience; they knew that they would be listening to words of wisdom.

He is remembered with particular affection because of his willingness to operate upon a referred case of "inoperable cancer of the stomach" many years ago. Following surgery, this tumor turned out to be, as Jerry suspected, a huge benign gastric ulcer that was duly reported in the medical literature.

Jerry was sixty-nine years of age at the time of his death. He attended Philadelphia schools nearly all of his formative years, receiving an A.B. from Temple University in 1937 and an M.D. from its School of Medicine in 1940. He entered the old Jewish Hospital as an Intern for two years, followed by a year in Pathology at the same institution. He then went on to the Graduate School of Medicine of the University of Pennsylvania for a year. This was followed by a Surgical Fellowship at the Mayo Clinic from 1944–1947. He received an M.S. in Surgery from the University of Minnesota in 1948.

Jerry Zaslow returned to Philadelphia to start practice in General Surgery. He initially tried to establish a joint medical-surgical group practice, but was too much ahead of his time for Philadelphia.

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In 1957 he started a surgical group with two colleagues which eventually became a six-man group.

Late in his career, recognizing the importance of physicians becoming knowledgeable in the Law, Zaslow enrolled as a night student in the Temple University School of Law and eventually had conferred upon him a J.D. degree in 1971. From that day on he not only continued his surgical practice but in addition developed an active legal practice, even becoming an Instructor at his Alma Mater. He served on the staffs of the Northern Division of the Albert Einstein Medical Center and the Rolling Hill Hospital where he was Chairman of the Department of Surgery. He also served as Chairman of the Surgical Department at the John F. Kennedy Memorial Hospital in Philadelphia.

In 1985 he was elected the one hundred and twenty-third President of the Philadelphia County Medical Society. He was also President of the North Branch of the County Medical Society. Other elective offices he held in that same organization were Director-at-Large, Chairman of the Committee on Professional Grievances and Chairman of the Board of Trustees of the Pfahler Foundation of the Philadelphia County Medical Society. Just before his untimely death, he was elected to serve a five-year term on the Board of Censors.

In the Pennsylvania Medical Society he served for many years as a member of the House of Delegates, ably and effectively representing Philadelphia. He also served as a member of the Council on Economics, Chairman of the Commission on Professional Liability, and Chairman of the Legislative Committee.

He was the author of more than sixty papers in the medical and surgical literature, and published one book, *Medicare and the Physician,* in 1979. He is survived by his devoted wife Rose (Paulie), a daughter Teresa, and five grandchildren: Jeremy, Kathryn, Angela, Jonathan, and Matthew. He was preceded in death by a son Richard, who was taken from his parents at the age of twelve.

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* * * * * * * * * * *

Errata to the June 1989 issue of *Transactions & Studies of the College of Physicians of Philadelphia:*

In the article " 'Looking Forward': An Exhibition Women and Medicine at the College of Physicians of Philadelphia" the Woman's Medical College is misspelled in several places as Women's Medical College.

In figure four of the same article, the names of F.C. Dohan and C.N.H. Long are reversed.

Editorial

This is my last issue as editor of the *Transactions & Studies of the College of Physicians of Philadelphia*, and as Director of the Francis C. Wood Institute for the History of Medicine. Editing this journal has been a great pleasure and education: about editing, about publishing "on disk," and about the College itself. The preparation of a publication that reflects the College's resources and departments, and presents them as "special sections," has kept me mindful of the importance and interdependence of those resources and personnel, not only for its journal but for all of its programs.

This issue does not have a special section on College material, but does have a theme: the politics of health care in its largest sense. Six years at the College have taught me to appreciate the role of this venerable institution as a medical meeting ground. I have also realized that this very detachment from the politics of individual institutions has permitted and, in fact, mandated a role for the College as a forum for the discussion of long standing and general political issues — issues of the medical profession, of social mores, and of cultural commitments. The four papers in this issue only suggest the possibilities of exploring what has been, and might be, happening in health policy, and to professional roles, in American medicine.

William Kissick uses his experience as a planner in the federal government to develop an evolutionary model of the American health care enterprise since the 1930s. As a counterpoint to this story of progressive change, Joan Lynaugh uses the metaphor of the yo-yo to introduce the unresolved and often unexamined issues that lie behind the current "crisis" in nursing. From Walter Lear we hear of a life outside the mainstream in late nineteenth-century American politics and medicine, in the person of the German "forty-eighter" who integrated professional medicine with radical politics, Ernst Schmidt. The final paper, by Michael Greenberg and Dona Schneider, proposes a future and more stable course for an American "wellness policy." Two of these papers, by Kissick and Lynaugh, were originally Wood Institute Seminars, and a third, by Lear, was read at a meeting of the College's Section on Medical History.

The incoming editor of the *Transactions & Studies of the College of Physicians of Philadelphia* is Nancy Tomes, Ph.D., who will be Acting Director of the Francis C. Wood Institute for the History

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of Medicine for the year beginning 1 September 1989. A social historian of American medicine, Dr. Tomes has taught at the State University of New York, Stony Brook, since 1978. Dr. Tomes is familiar with the College, having done research here for her first book, *A Generous Confidence: Thomas Story Kirkbride and the Art of Asylum-Keeping* (Cambridge University Press, 1984), and having spent the past year at the Wood Institute as a Rockefeller Fellow doing research on popular responses to the germ theory. I look forward to reading the journal under her editorship, and continuing my education about the College. Welcome and farewell!

The Evolution of American Health Policy

WILLIAM L. KISSICK

The Past is Prologue

The American health care enterprise, a $554 billion societal endeavor that consumed 11.5 percent of gross national product (GNP) in 1988, required a labor force of six million professional, technical, and support personnel the same year. This colossus, however, did not spring full blown from the head of Zeus. Nor have we experienced a comprehensive, legislative reform in our society comparable to the all-pervasive dimensions of the British National Health Act of 1946. Even the sum of the three dozen health initiatives of the 89th Congress (1965 and 1966), more then any previous Congress since the First in Philadelphia in 1789, were less than all-encompassing. Our path, to quote Professor Charles Lindbloom, the Yale political scientist, has been one of "disjointed incrementalism."[1] The health care enterprise, notwithstanding its origins in Colonial times and its precedents imported from England, Scotland, and the Continent, has essentially grown to its current dimensions and maturity since the 1930s.

The evolution of contemporary health policy in the United States can best be understood in terms of five sequential, not mutually exclusive eras, each with a dominant theme. These correspond with the major components of the health care enterprise: (1) Population Categories, (2) Basic Resources, (3) Delivery Systems, (4) Institutional Infrastructure, and (5) Systems Dynamics. It would appear that we crossed the threshold of the fifth era in the 1980s. The remainder of the twentieth century may well focus predominantly on the interaction and dynamics rather than any of the specific components in the health care enterprise. Concurrently, health care systems appear to be coming full-cycle with a new emphasis on the consumer, this time within self selected population groups rather then the political jurisdiction; e.g. cities, counties, or states that underlie organized public health.

This paper was presented at a Wood Institute seminar at the College of Physicians of Philadelphia on 3 November 1988.

1. Charles Lindbloom, "The Science of Muddling Through," *Public Administration Review*, 1959, *19*:79–88.

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The road to comprehensive health services has been sequentially paved with five layers of recommendations from the Committee on the Cost of Medical Care. The five points of the majority report (published as *Medical Care for the American People* in 1932)[2] have been implemented in whole or in part over a half-century.

1. Medical Service, both preventive and therapeutic should be furnished largely by organized groups of physicians, dentists, nurses, pharmacists, and other associated personnel.
2. All basic public health services — whether provided by governmental or non-governmental agencies — should be available to the entire population according to its needs.
3. The cost of medical care should be placed on a group payment basis, through the use of insurance and taxation.
4. Studies, evaluation, and coordination of medical services should be considered important functions for every state and local government.
5. The breadth, depth, and focus of health professions education and training should be expanded.

This paper argues that these goals define the stages of our history. Health Policy has traversed five phases, each representing the dominant theme of health policy at intervals of approximately one decade to build on the foundation of its predecessors (See Fig. 1).

Population Categories	1935–1945
Resource Development	1945–1960
Delivery Systems	1960–1970
Institutional Infrastructure	1970–1980
Systems Dynamics	1980–

Each of the health policy themes is one of the major components of the paradigm of the health care enterprise. The health care enterprise has emerged from the evolution of health policy, much as biological ontogeny recapitulates phylogeny.

Initial Thrust of National Health Policy

During the early 1930s, the Social Security Study Group established by President Franklin D. Roosevelt (to develop his proposals for the Social Security Program) was determined to include health care

2. The Final Report of the Committee on the Costs of Medical Care, *Medical Care for the American People* (Chicago: University of Chicago Press, 1932).

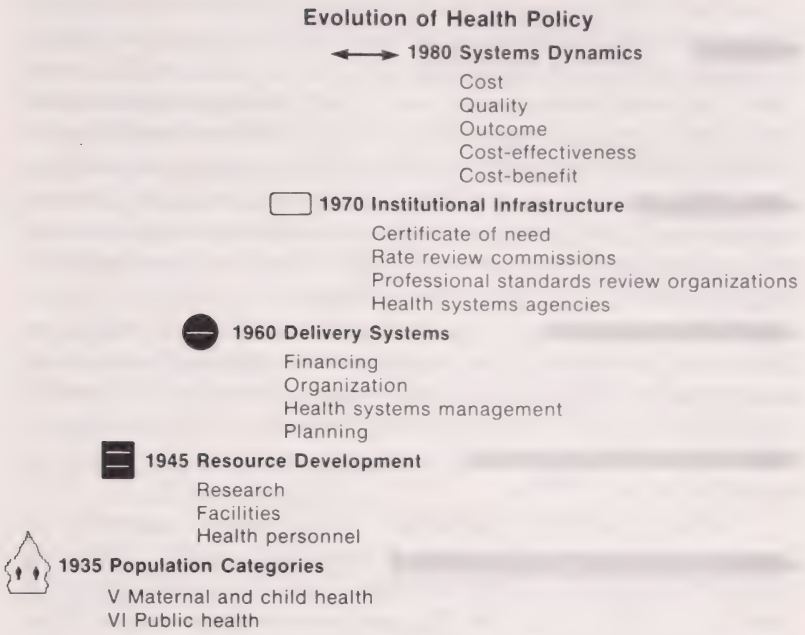

Figure 1. Evolution of Health Policy

benefits in the proposed legislation. This move engendered vigorous opposition from the American Medical Association. President Roosevelt, faced with the political possibility of risking Social Security, his prime domestic proposal, by including health care coverage, omitted it in the final document.

Although health insurance benefits under Social Security were rejected, the Social Security Act did launch national health policy. Human misery in the Great Depression dramatized that voluntary efforts and those of state and local governments were not sufficient to meet the health needs of the population. Health problems among the poor became so serious during the 1930s that the Federal Government was forced to become concerned with the health of its citizens. The Federal Emergency Relief Administration was created in 1933 and assisted states through grants-in-aid to maintain unemployment or relief programs. Subsequently, this legislation was expanded to provide some medical services to recipients of unemployment relief programs.

Title V of the Social Security Act of 1935 authorized grants to individual states for Maternal and Child Health Programs. Title VI authorized annual appropriations ". . . for the purpose of assisting states, counties, health districts and other political subdivisions of the states in establishing and maintaining adequate public health services." These titles working through the states in collaboration with local and state government, represented the initial thrust of national health policy focused on specialized problems (for example, communicable disease control and a special risk group within the population, i.e., women and children).

It is important to emphasize that this initiative of the Federal government attempted to build upon and elaborate public and community initiatives going back more than a century to the State of Massachusetts in 1869 and the City of Baltimore in 1793. These in turn were not unrelated to the community and Colonial precedents traced to the early 1700s.

Health insurance benefits for Social Security recipients, although dropped from President Roosevelt's legislative proposal, were not a dead or an abandoned issue. Deliberations and advocacy continued. These led to the Wagner-Murray-Dingle proposal for national health insurance in the late 1930s. Some observers claim that this legislation would have passed were it not for the outbreak of World War II, which placed a moratorium on domestic policy for the duration. As a consequence, the dominant theme for national health policy during the decade 1935 to 1945 was limited to categorical assistance for certain vulnerable groups, with health policy initiatives limited to Titles V and VI of the Social Security Act. Health care remained an individual concern to be addressed in the voluntary or private sector of society at the outbreak of World War II. The surrender ceremony on the deck of the U.S.S. Missouri in Tokyo Bay allowed the United States to turn to domestic priorities.

Investments in Resource Development

On 10 September 1946, in a ceremony in the Oval Office of the White House, President Harry A. Truman signed the Hospital Survey and Construction Act. With his signature on the Hill-Burton Program, as the legislation would be known for decades to come, President Truman forecast the theme for national health policy that would prevail until the 1960s. Notwithstanding Truman's proposals in 1948 for universal health insurance, the lineal descendant of

the Wagner-Murray-Dingle Bill and the Social Security proposal of 1934, the dominant health policy theme of the Fair Deal and the ensuing Eisenhower Administration was Federal investment in health care resource development.

National health policy in mid twentieth-century America assumed that health, and the services necessary to achieve health, were the private concern of the individual. As noted, the policy also accepted the fact that certain vulnerable individuals, the poor and disabled, warranted public assistance. However, the Federal government undertook to insure the availability of basic health resources to facilitate provisions of the health services required. For fifteen years, post-World War II investments in development of basic health resources constituted the dominant theme in health policy. Priorities focused on

1. Research and Development
2. Facilities and Technology
3. Health Manpower

as the essential ingredients that gave health service systems their character.

Research and Development

Interest of the Congress in investments in medical research can be traced to 1937 with the establishment of the National Cancer Institute, the first of the National Institutes of Health. This was followed in 1946 with the authorization of the National Heart Institute (now the National Institute of Heart, Lung, and Blood Disease) and in 1948 with the creation of the National Institute of Mental Health. Beginning in the 1950s a series of additional categorical institutes were authorized. A recent flourish of name changes and additions have brought to a dozen the list of disease-specific national research institutes.

The National Institutes of Health strategy for support for basic undifferentiated and targeted research has been carried out on a scale unprecedented in history. During the last thirty-five years, investments of federal funds for biomedical research and development have risen to approximately $9 billion per year. These investments have had a profound impact on our understanding of the biomedical aspects of disease. Although clinically applicable breakthroughs *per se* may have been limited, the fundamental advances in the basic scientific frontiers are widely acknowledged. Investment

in the development of this resource was clearly a commitment of tax resources to voluntary as well as public institutions in the interest of the public good.

Facilities and Training

The character of health facilities in the United States changed dramatically under the impetus of investments by the Hill-Burton Program. The Program assisted more than 4,000 communities in the building of hospitals, public health centers, extended care facilities, diagnostic and treatment centers, and rehabilitation facilities. Virtually no community of any size in the United States was left unaided. In addition to its bricks and mortar thrust, the Hill-Burton Program guided incorporation of technology, standards for care, and modification in delivery systems.

The Hill-Burton Program also fostered the development of area-wide hospital planning, although the original suggestions of the legislation for extensive hospital planning were never executed. Notwithstanding the rural bias in the distribution of grants, the Hill-Burton Program sought to see that every community in the nation of any significant size had 4.5 general hospital beds per 1,000 people.

Health Personnel

Involvement of the Federal government in the development of health manpower began in 1948 when the National Institutes of Mental Health included the support of service training among its inaugural programs. The next step was taken in 1956 when the Congress authorized support of the training of public health manpower or more precisely the professional talent needed to staff the programs of concern to the Federal government since the authorization of Title VI in 1935. Health manpower initiatives were broadened in 1957 with the support of the training of nurses for administrative, supervisory, and teaching responsibilities. Although in some ways a precedent for a new dimension of national health policy, these several initiatives collectively were but minority interests in the broad concerns of a health labor force numbering some three million people.

A broader investment in health personnel did not occur until 1963 when Congress provided construction grants and student

loans to schools of medicine and dentistry. Outright curriculum subsidy and scholarship were authorized in 1965, and health programs added. There ensued the Nurse Training Act of 1964, the Health Professions Assistance Act of 1965, the Allied Health Professions Personnel Training Act of 1966, the omnibus Health Manpower Act of 1968, and subsequent amendments in 1970, 1973, and 1975. Taken in their entirety, these legislative attainments demonstrate that American health policy has had a dynamic relationship to shifting perceptions of need.

Delivery Systems

The basic resources for health care have their *raison d'etre* in the output of health services available and accessible to patients and populations. The decade of the 1960s saw the addition of a new health policy theme; i.e., health care delivery systems. The categorical thrust and investments in the development of resources continued, but initiatives for delivery systems were added.

The strategy remained targeted and incremental rather than comprehensive. However, no longer would the translation of basic resource inputs into health service outputs be left to the private or voluntary sector free of government involvement. The congressional initiatives did not call for an end to the private and voluntary sector but rather for a "partnership" in the public interest.

Health policy, prior to the Kerr-Mills Legislation in 1960, continued to consider health care to be largely the private responsibility of the individual and family. However, the public assistance for certain groups in need was expanded and investments in financing, organization, delivery systems, and planning were added to the categorical initiative and development of basic resources. A concern with systems was emerging. The basic resources of knowledge, facilities, and manpower required an "entrepreneurial factor" or "production function" for their translation into products or services.

It has long been assumed by the Congress and the body politic that medical care was exclusively the business of physicians and that they alone played the role of entrepreneur. For almost two centuries of our society, this was indeed true. However, while the physicians made the purchasing decisions by the prescription, someone else paid the bill. The assumption that if sufficient funds were invested in the creation of basic health resources, then the necessary services would be forthcoming and available to the general popula-

tion, prevailed throughout almost two decades of investment (1945–1965). However, it became increasingly evident that Federal investments in resource development, no matter how massive, would not solve existing health problems. Society became increasingly aware that, despite the highest per capita expenditure for health and medical care in the world, the United States had neither equity in access to health services nor the highest level of health, compared with other developed nations. The 1960s brought an end to complacency and the demand for solutions to existing health care problems. In response, the Administration and the Congress led the society into a new era in health affairs.

Financing Health Care

Three decades after health insurance had been rejected as a component of the original Social Security Act in 1935, coverage for the elderly and the medically indigent was enacted by the United States Congress. The Social Security Amendments of 1965 (Public Law 89–97) were a landmark effort in the United States to eliminate the economic barriers to medical care. Precedents for Title XIX (Medicaid) were established by the Congress with the Kerr-Mills legislation in 1960. In addition, Public Law 89–97 built on legislative deliberations traced to the Wagner-Murray-Dingle Bill.

The Medicare/Medicaid legislation addressed an estimated 40 million people or twenty percent of the population by pumping billions of dollars into the *status quo*. Payment by these programs of "usual and customary fees" to physicians, and reimbursement of costs for hospital care, followed prevailing financial mechanisms and assumed that existing mechanisms for the delivery of health care, fee-for-service and solo practice for physicians, and retrospective cost-based reimbursement, could respond to the population's needs and demands when payment for services was provided.

The economic consequences of Medicare and Medicaid can be appreciated when one realizes that, during the past twenty years, these two programs have pumped $1.13 trillion into an essentially oligopolistic, non-market economy lacking checks, balances, and regulatory feedback. The *laissez-faire* strategy for financing dominated the decade of the 1960s into the 1970s when efforts were initiated to develop competitive, planning, and regulatory infrastructures that were intended to reshape the health care enterprise.

Organization

Delivery Systems, or the "production function," are shaped by the interrelated characteristics of financing and organization. The Medicare and Medicaid legislation financed the existing predominant pattern of medical practice, solo practice, and voluntary hospital staffs. In fact the legislation sought that nothing in the Act be construed to interfere with the existing practice of medicine. The Congress of the United States in 1965 endorsed fee-for-service and solo practice as a bulwark of defense against organizational change.

Financial and organizational strategies were, however, recognized by the Congress. Although Titles XVIII and XIX chose to adopt the existing pattern of organization of health services, other initiatives during the 1960s authorized grant support for programs undertaken to organize health services to serve population groups. These efforts evolved into Health Maintenance Organizations, hospital-medical staff joint ventures, multi-institutional systems, and health alliances of the 1970s and 1980s now categorized as "alternative delivery systems" for the organization and provision of health care.

The advances in organizations were the result of individual and seemingly unrelated legislative skirmishes. Targeted segments of the population were served through such organizational innovation. The Migrant Health Act of 1962 is a little-known initiative. Mothers and children had been a group of special concern since the Sheppard-Towner Act of 1920. The Maternal and Child Health Amendments of 1963, 1965, and 1967 provided Federal funds for the development of comprehensive health services.

The Office of Economic Opportunity demonstration projects, funded in 1966, were more visible. Health centers and group practices were developed across the country for under-served and poverty-stricken communities. Although the dangers of two class medical care were recognized — organized delivery systems for the poor and "free choice, solo-practice, and fee-for-service" care for the middle class — these OEO initiatives were soon joined by other programs.

Section 314(e) Project Grants for Health Services Development of the Comprehensive Health Planning and Public Health Service Amendments of 1966 (Public Law 89–749) funded projects that ranged from prepaid group practice to hospital based primary care

programs; the legislation moved organizational innovation to the mainstream of medicine and the middle class. This statute subsequently subsumed Migrant Health, Maternal and Child Health and OEO projects into a broader strategy and was the precursor to the HMO Act of 1974. One of the most extensive experiments in organization and delivery systems occurred in Central Appalachia. The Appalachian Regional Development Act, authorized in 1964, was the Federal approach to counteract the appalling poverty witnessed by Senator John Kennedy when he was campaigning in West Virginia for the nomination of the Democratic Party. Section 202 of the legislation authorized the support of multi-county demonstration health facilities.

The 1960s addressed organization as a subject more of experimentation than implementation. Initiatives were collectively on a small scale. Trends had been set in motion that would reach fruition in the Health Maintenance Organizations and Community Health Centers legislation of the 1970s. Although the lesser partner to financing, organization contributed to significant advances in the development of delivery systems.

Looking back over the decade of the 1960s, health policy, while moving in a broad front, had not attempted a comprehensive solution for meeting the health needs of the American people. The experiments in organization notwithstanding, the dominant conviction at the end of the 1960s appeared to remain that the health care enterprise would work with tinkering rather than overhaul. This assumption, however, was questioned in the 1970s, and a number of initiatives were attempted. One of them, the HMO Act of 1974, was an extension of the agenda of the 1960s.

Health Maintenance Organizations

"What's in a name?" Juliet asks Romeo. Apparently a great deal, as Prepaid Group Practice was clothed in the sobriquet Health Maintenance (HMO) by consultants to the U.S. Department of Health, Education, and Welfare. The ancestry of group practice can be traced in the industrial programs, in the mining, timber, and railway industries in the late 1800s. The first acknowledged prepaid group practices were the Community Hospital Clinic of Elk City, Oklahoma and the Ross-Loos Medical Group; each were founded in 1929. These consumer cooperatives and prepaid schemes have served as lightening rods for attracting the opposition and hostility

of organized medicine. Only a few prepaid group practices, notably Group Health of Puget Sound, and Group Health Association of Washington, D.C., developed in the ensuing years. The two giants of prepaid group practice were the Kaiser Foundation Health Plan and the Health Insurance Plan of New York. Each suffered the opposition of county medical societies ranging from the denial of hospital privileges to social ostracization of the physician and his family. Following World War II the medical societies were successful in passage of restrictive legislation to inhibit group practice in more than forty states. In 1974, the Congress of the United States was determined to interfere ". . . with established practice of physicians and hospitals" that had been precluded in The Partnership for Health and all other health legislation. The strategy launching the enactment of the Health Maintenance Organization Act of 1974 advocated competitive alternatives to fee-for-service and solo medical practice. Subsequent developments have been rather slow when contrasted with the aspirations of HMO enthusiasts.

Institutional Infrastructure

The late Swedish economist Gunnar Myrdal, in his book *Beyond the Welfare State*, describes the dynamics of decision making in a democratic society as follows:

> Within the framework of state controls the organizations have gained and not lost in influence . . . [R]egulatory coordination, undertaken by the state authorities, is ordinarily carried out only after consultation and actually in cooperation with the organizations . . . [T]he increasing strength, number, and activity of these organizations . . . has meant a spreading out of participation, initiative, and influence . . . to ever larger sections of the people . . . It represents a decentralization of the making and implementation of public policies.

He characterizes this process as "the institutional infrastructure of modern organized society."[3]

The dominant health policy decisions of the 1970s addressed the incremental development of that institutional infrastructure in the health care enterprise.

National health polices, promulgated by the Federal Government as represented by the Health Care Financing Administration,

3. Gunnar Myrdal, *Beyond the Welfare State* (New Haven: Yale University Press, 1960), p. 47.

and voluntary initiatives — be they advanced by the Blue Cross-Blue Shield Association in Chicago or the American College of Physicians in Philadelphia — suggest the spectrum of societal postures that shape the institutional infrastructure of health affairs. Local communities and agencies in the public and private sector also shape the institutional infrastructure of component institutions.

The institutional infrastructure of health affairs is both complex and diverse, with components such as the licensing of physicians dating back to the mid-nineteenth century, and hospital accreditation, led by the American College of Surgeons in the early twentieth century. New players arrive on the playing field on a regular to seemingly random basis, as some seek to define our eleemosynary - quasi - public - community - accountable - consumer - influenced health care enterprise. While we seek an enterprise that is principled, albeit pragmatic, it is certain to be pluralistic.

Health Planning and Regulation

Health planning can be traced back to the hospital planning initiatives of the 1940s and 1950s and particularly the Hill-Burton Act of 1946. The Hill-Harris Amendments to the Hill-Burton Act of 1964 provided matching grants for the support of area wide hospital planning. The program lacked time to become sufficiently developed before it was subsumed by the Comprehensive Health Planning and Public Health Service Amendments of 1966 (Public Law 89–749). Nonetheless, a precedent for voluntary, area wide hospital planning assisted by the public sector was established.

This tentative beginning of Area Wide Hospital Planning in a few communities was succeeded in the mid-1960s by Regional Medical Programs and Comprehensive Health Planning, both in turn to be little more than a way station enroute to the National Health Planning and Resources Development Act of 1974. The imminent expiration of the authorization of Public Law 89–749 provided Congress with the opportunity to reassess planning and regulatory mechanisms in the health care enterprise. After extensive hearings, legislation was passed by the Congress and signed by President Ford in January 1975. A network of State Health Planning and Development Agencies and some 200 Health System Agencies in communities throughout the nation, incorporating the State regulatory mechanism of Certificate of Need, sought "coordination of

health services."[4] The bold experiment failed, and health planning has declined.

Professional Standards Review Organization

The Social Security Amendments of 1972 sought to address the problems of cost and quality of medical care. The priority was clearly costs. The billions of dollars pumped into the health care systems since 1965 fostered an extraordinary inflation. Senator Charles Bennett proposed the creation of a Professional Standards Review Organization (PSRO) to assess the utilization of hospital services, their quality, and the resultant costs.

The PSRO movement experienced the rocky course that characterizes most new national programs. Although originally highly criticized in terms of its cost-effectiveness, there is recent evidence to indicate that the Program indeed saved money in reducing unnecessary utilization. As a regulatory measure, PSROs were replaced in the 97th Congress (1982) by Peer Review Organizations (PRO).

The 1970s came to a close with the defeat of the hospital containment legislation proposed by the Carter Administration. The issues of planning and regulation had dominated a decade of health policy. Limits of intervention were still under debate. The Federal Trade Commission began to challenge the health care enterprise to become more competitive and responsive to market forces. It attacked a number of issues ranging from physician advertising to physician domination of Blue Shield insurance boards. Challenges reflected the philosophic conviction that the delivery of health care was inherently oligopolistic and had to evolve from provider domination of decision-making and avoid restraint of trade. The health care enterprise as a mixed regulated economy was responding to diverse challenges. On a scale of 0 to 100, representing complete free enterprise and government ownership and operation, the health care enterprise ranges between thirty and seventy on the scale while poised to lunge in both directions at the same time.

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4. J. W. Mountain, E. H. Pennell, and V. M. Hoge, *Health Service Areas: Requirements for General Hospitals and Health Centers*, Public Health Bulletin, No. 292 (Washington, D.C.: U. S. Government Printing Office, 1945).

Systems Dynamics

The advent of the 1980s found all the components of the system in place. The competitive and regulatory eclecticism of the health care enterprise has contributed to a focus on systems dynamics. Perhaps nowhere are these dynamics of interaction better illustrated than with Diagnostic Related Groups (DRGs).

To some observers, DRGs are the central focus of competitive or market forces in health care systems. Hospitals ranging from small community institutions to major academic health centers compete, DRG by DRG, to produce the optimal case mix within prospective payment schedules. Other observers point out quite correctly that Diagnostic Related Groups are in fact regulated prices for specific services, therefore, avoiding price competition. DRGs are one among many examples of the regulatory and competitive eclecticism that characterizes health affairs in our society as we address cost and quality trade-offs that are both cost-effective for the health care system and beneficial for the society.

Over the past half century, from the Committee on Costs of Medical care to the contemporary conceptualization of the American health care enterprise, our society has witnessed extraordinary growth in the scope, depth, complexity, and promise of health care. We now face a new tension between infinite need and finite resources. Now that we have developed the means, we must address the ends.

The decades ahead will see a new focus on linkages and interrelationships among and between the components and dimensions developed over five decades. The past, while prologue, has been largely structural. The future lies with values, priorities, and purpose; in sum the *raison d'etre* of health care in a democratic society.

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Riding the Yo-Yo: The Worth and Work of Nursing in the 20th Century

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Once again a sense of crisis seems to pervade most discussions of nursing in the United States. Journal articles, conferences, and special reports studying the "nursing problem" abound. In this essay on the roots of this "crisis," I will analyze some of the social priorities and assumptions that have shaped nursing's history over the past one hundred or so years in the United States. Then I will review the impact of some of our implicit and explicit social values on the work and worth of nursing. My hope is to enlarge our understanding of the current dilemmas we face in nursing recruitment and retention by interpreting the relationship and consequences of past priorities, assumptions, and values.

To set the stage for this essay, however, I will rely on a single anecdote. A meeting of nurses, physicians, and hospital administrators was called to discuss and recommend solutions to the growing number of vacant nursing positions in the large urban hospital for which the meeting participants were responsible. Comments and suggestions were flying around, as they usually do at such sessions, until finally, one young physician spoke up in some exasperation.

"I don't see what the problem is," he said. "There is plenty of unemployment in Pennsylvania; let's just send up to the coal country for some of those girls. They will be glad to get the work." He had a ready solution to not just one, but two tough problems; a solution often suggested and tried in the distant and not-so-distant past. For we have often sent away for more nurses: to the farms or the factories, to the Phillipines, in fact, to anywhere we think we will find people willing to staff our episodically nurse-starved hospitals.

What does this anecdote have to do with our current difficulty in attracting sufficient and capable students to our educational programs? The impatient call for a quick, cheap fix for the nurse

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shortage, coupled with the "cannon fodder" approach to selecting candidates for nursing inherent in the physician's suggestion to simply import "girls from the coal country," reflects some of the social priorities, assumptions, and values which have underlain the American nursing experience and led to the crisis we now confront.

Social Priorities in Health Care — One Face of the Yo-Yo

In the one hundred or so years since nursing became a recognized discipline in the United States, at least three social priorities have directed its development. First, the transfer of the work of caring for the sick from the domestic/home arena to the professional/institutional arena; second, the implementation of a host of diagnostic and therapeutic activities directed at the cure of specific diseases or injuries which seem amenable to biomedical intervention; and third, the protection of the American public from the "dangerous" sick, while assuring the health of potentially productive children and their mothers. These social priorities persist, but their influence is, by no means, consistent over time. As an integral part of the social fabric, nursing both responds to, and affects debates over, health priorities; as individuals, nurses sometimes adopt reform postures or, just as often, fight for conserving the status quo.

Transferring Care of the Sick

The very existence of American nursing is grounded in our nineteenth-century decision to transfer part of the work of caring for the sick from the home and family to the hospital and trained attendant. As the country grew and became affluent in the years after the Civil War, Americans turned their attention to health and illness in their communities. Influenced by European ideas, by religiously inspired perfectionism, by local competitiveness, and by the pressures toward collective social action made necessary by an ever growing urban population, hospitals appeared in virtually every American city. During the forty years after 1880 more than 7000 hospitals were established. Some were quite ephemeral; a significant proportion, however, became integral, essential community institutions supported and used by all segments of the population. Two essential ingredients in these new social institutions were the nurse superintendent and the training school for nurses.

The transfer of the care of the sick and injured could not be accomplished to the satisfaction of the middle class unless the

Philadelphia Hospital (PGH) Ward, 1890.
Courtesy of the Center for the Study of the History of Nursing, University of Pennsylvania.

caretakers in the institution were as reliable, respectable, and clean (in all senses) as the mothers or sisters who were formerly charged with the responsibility. In addition, the hospital had to be safe, as safe as home, especially if the transfer of care involved the care of children and women, as it came to do at the turn of the century. Thus, the invention of American nursing is tightly linked to the success of the modern hospital.

The concept of the intelligent, respectable woman heading an institution under the guidance and control of a socially responsible, and often all male, hospital board fit very well with American domestic ideals of the late nineteenth century. The hospital school, where women could be fitted for a life of needed service, while at the same time reducing the expenses of the hospital through their free labor, blossomed in the pragmatic reform climate of the times. Over the first few decades of development nurse superintendents and their pupils assumed responsibility for the care of sufferers from infectious disease, the chronically ill, injured workers, the alcoholic and the insane, the aged, and later on, the sick or injured child and the laboring mother. Initially, these patients were poor or without family resources but, as the new century began, hospitals became

more and more popular as agencies of first resort for the sick and injured of all classes.

Biomedical Interventions

Interwoven with the substitution of trained nurses and hospitals for family and home in times of illness was a revolution in thinking about disease, its treatment, and prevention. By the 1880's the concept of disease as specific in origin and amenable to specific treatment began to spread. By 1900 the power of the germ theory in explaining the origin of infectious diseases such as cholera, diphtheria, and later tuberculosis, had captured the imagination of the public. Linkages between physicians and science, at first only academically interesting in the case of anatomy and physiology, attained popular importance when microbiology and chemistry began to offer physicians real tools to understand, prevent, diagnose, and eventually treat frightening infectious diseases. Perhaps even more potent was the surgeon's new freedom to try to repair the body — using anesthesia to prevent pain and antisepsis or asepsis to prevent infection.

The medical revolution swept into the hospitals where domesticity had so briefly reigned and began to convert them to the purposes of the new scientific medicine. Good medical practice, once home and office based, began to require regular access to hospital beds. The physician's work was transformed from the holistic, individualized nineteenth-century encounter between an advisor and his patient to a standardized twentieth-century search for specific disease and selection of treatment. As historian Charles E. Rosenberg puts it, the physician was "hospitalized;" in the process the nurse and her hospital were conscripted into the service of the new scientific medicine.[1]

Both the work and mission of the nurse shifted. The hospital had proved safe and attractive as a substitute for the home during illness. The nurse created order out of the chaos of sickness, provided food, cleanliness, and nurturance, and relieved families of some of the burden of illness. Now, however, she added the task of managing the "temple of science" that promised successful treat-

1. My conceptualizations of the interplay between hospitals and health professionals and the larger American society have been manifestly enhanced by the insights of Professor Charles E. Rosenberg of the University of Pennsylvania. For elaboration of this concept see Charles E. Rosenberg, *The Care of Strangers: The Rise of America's Hospital System* (New York: Basic Books, 1987), Chapter 10.

ment and cure rather than relief of suffering and a peaceful death. Nurses became the implementors of twentieth-century medical care; they created an antiseptic and, where necessary, aseptic environment; they regularized prescribed treatments, enforced medical rules, oversaw laboratory testing, and dispensed drugs. Meanwhile, nurses continued to feed, clothe, and nurture patients. By 1920, however, control of the patient's hospital experience was in the hands of the physician.

Hospital boards, nurses, and physicians wholeheartedly accepted biomedical strategies as the framework for all of their work. Yet, as the hospital turned to the task of searching for causes and trying out treatments of disease among its patients, little place was left for the chronically ill, the marginally dysfunctional, or the aged.[2] Both nurses and physicians arranged their priorities to give maximum attention to the singling out and conquering of acute disease.

For the nurse, however, the prize was small and the price high. As implementor, rather than conceiver of the new medical strategies, she seemed to require only training rather than an expensive college education. And, ironically, she rarely played her role inside the "temple" because, once training was complete, she was on her own in the world of private duty nursing which usually was conducted in the patient's home. Her place in the hospital was taken up by the new pupil who was admitted to the training school upon her departure. Perversely, the growing popularity of hospitals steadily undermined the private duty practice of the graduate nurse; the patients who would have paid her for care at home went, instead, into their local hospital.[3]

Protection From the "Dangerous Sick"

Some nurses, however, were attracted to the third social priority, and worked to protect the public from the "dangerous sick," and to provide health education for children and their mothers. Reform-

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2. Joan E. Lynaugh, *The Community Hospitals of Kansas City, Missouri, 1870–1915* (New York: Garland Publishing, Inc., 1989). See also Joan E. Lynaugh, "From Respectable Domesticity to Medical Efficiency: The Changing Kansas City Hospital, 1875–1915," in Diana E. Long and Janet L. Golden, eds., *The American General Hospital: Communities and Social Contexts* (Ithaca, NY: Cornell University Press, forthcoming).

3. The best discussion of this ironic phenomenon may be found in Susan Reverby, "Something Besides Waiting, The Politics of Private Duty Nursing Reform in the Depression," in Ellen Lagemann, ed., *Nursing History: New Perspectives, New Possibilities* (New York: Teachers College Press, 1983), pp. 133–156.

ers of the nineteenth century saw that American cities were breeding places for disease; slums and poverty combined to undermine the growth and progress that they hoped was to be the destiny of the United States. Religious impulse, too, inspired some prominent citizens to seek ways to alleviate the difficulties of city life. Though benevolent organizations existed from colonial days, nurses entered the scene in the 1880s, when they were recruited by the founders of what came to be called visiting nurse societies. The "Visiting Nurse" movement grew slowly at first, but then began to spread rapidly across the country from Buffalo, Philadelphia, New York, and Boston. The central idea was to bring to the poor or abandoned person instruction, cleanliness, comfort and sometimes material aid.

Most visiting nurses were remote from physician influence; their early alliances were with the middle class women who founded and financed the visiting nurse societies. By the turn of the century, their focus was on teaching the laws of health, preventing the spread of infectious disease, supervising child care, assisting the chronically ill, and aiding sick workers and their families. Their approach sought Americanization for the immigrant, urged the importance of work and self-reliance, and tried to discourage dependency. The introduction of school nursing by Lillian Wald in New York City, for example, was fueled by her proof that school nurses could reduce truancy among immigrant children. Thus the Visiting Nurses were agents of middle class socialization for the poor and the "new" American.Though rural visiting nursing did develop later, it was the problems of urbanization that created public and philanthropic support for the visiting nurse movement. Fear of the poor, especially the immigrant, and fear of infectious disease, especially infant diarrhea and tuberculosis, caused the public to look with favor on these progressive women who risked their lives on the city streets to bring health to the downtrodden. Visiting nurses received their education on the job, however, as most were trained in the hospital system; few special programs were available to prepare public health nurses before the late 1920s. Nevertheless, visiting nurses, school nurses, industrial nurses, and tuberculosis nurses became something of an elite corps among the rapidly burgeoning occupation. The visiting nurse movement overlapped with the urban reform movement of the Progressive Era and relied on the same faith in experts, government involvement in social problems, and education. Leaders in

visiting nursing joined some of the nurse superintendents in large hospitals to agitate for better educational opportunities for nurses.[4]

American society developed many institutions to enable the transfer of care of the sick away from home; it embraced the achievements of the biomedical strategy of identifying and treating disease, and it admired and respected the work of the visiting nurses that protected it from the dangerous sick. American assumptions about health care, nevertheless, inhibited the creation of a rational educational system for preparing nurses to address these social priorities. This was true of nursing in spite of the fact that contemporary women's occupations, such as teaching and social work, did find educational niches in the American college system.

Unexamined Assumptions — The Second Face of the Yo-Yo

I will identify four somewhat overlapping American assumptions or habits of thought related to care of the sick that contributed to our failure to come to grips with the realities, intellectual and fiscal, of formally educating nurses. Some of these habits of thought still pertain; others are on the wane. This is not an exhaustive list; I will focus on American assumptions about voluntarism and health care costs.

The Free Labor Pool

First, our hospital system and much of the rest of our health system was founded in the private, voluntary sector, not originally vulnerable to collective political influence. During the era of their rapid development, between 1880 and 1910, hospitals grew up in communities where laissez-faire government was the norm. Hospitals were absolutely free to fix the rules of competition and the conditions of labor. There was no central planning of any kind at the local or state and certainly not at the national level. Nurses, with their complete reliance on hospitals, became in a sense the victims, educationally, of their own success. The founders of hospital training schools created a formula perfectly suited to an under-financed,

4. For a thorough and penetrating analysis of the successes and weaknesses of the visiting nurse movement see Karen Buhler-Wilkerson, *False Dawn: The Rise and Decline of Public Health Nursing, 1900–1930* (Ann Arbor: University Microfilms, 1984). See also, Karen Buhler-Wilkerson, "Left Carrying the Bag: Experiments in Visiting Nursing, 1877–1909," *Nursing Research*, 1987, *36*:42–47.

marginal institution operating in an almost totally unregulated environment. What industry would willingly give up a free labor pool?

Religious and Benevolent Missions

The health care institutions of the late nineteenth century were dominated by religious, benevolent, and professional groups. Most of America's community hospitals were (and still are) either nonprofit voluntary hospitals or proprietary hospitals; less numerous were the city or county institutions for the poor or the teaching hospitals then developing under the influence of medical schools. Standards in community hospitals were at first based on their religious or benevolent missions; most proclaimed a role in care of the worthy poor, accommodation standards comparable to the domestic standard of the community, and an open door policy to all in their community regardless of the hospital's sectarian or ethnic origins. Their nurses' training schools were intended to serve the hospitals' missions; no mention was made of the hospitals' obligation to their school or students. After the turn of the century, when serious efforts by the nursing leadership to improve education for nurses began to surface, no real attack on the conflict of interest between the hospitals' interest and the interest of their students was launched. It is surely fair to speculate that the hospitals' immunity from attack as exploitative institutions was partially due to the hospitals' benevolent, community service role. By 1910 leaders in nursing education in the hospitals began to rate schools according to hospital size, the number of years of training per nurse, and affiliation with national nursing organizations. These informal standards, promulgated in national nursing meetings, succeeded earlier ad hoc religious or benevolent criteria but still made no mention critical of, much less suggestive of, abandoning the hospital training system. Thus, nursing seemed to be subsidizing the voluntary sector hospital system and, apparently, was willing to do so.[5]

Generation of Hospital Revenue

There was a good economic reason for clinging to the hospital system for educating nurses who, by the first decades of the twenti-

5. Voices of complaint were raised though not heeded. Adelaide Nutting, a nurse and educational leader, began to argue in favor of independence from hospital domination about 1908 but neither she nor other critics had much impact on hospital training schools. The transition from hospital-based to college-based nursing education moved very slowly until after World War II.

eth century, seemed indispensable. These schools generated their own revenues through student labor, often creating income for the hospital by charging patients for special care by students. Later, in the 1930s and 1940s, the costs of the schools were passed along to the patients through direct billing or to insurance companies through negotiated rates. For the first seventy-five years of the existence of organized nursing the hospital training school system made it possible for healthy Americans to completely ignore the potential high costs of educating a large supply of nurses. This odd and interesting method of providing the labor for a quasi-public service, delivered by private institutions using an educational mechanism, clung to our social fabric for years without serious challenge. It meant that hospitals were staffed by a constantly rotating pool of workers, called pupils, which turned over completely every three years.

Surplus Nurses

Another persisting American habit of thought about nursing is a preference for abundance. Whenever it appears that an abundant or over-supply of nurses may not be immediately in the wings, a call goes out for speeding up production of nurses, adding briefly trained assistants to staff hospitals, sending for nurses overseas, sending to the equivalent of "the coal country" for unemployed women, or recalling unemployed nurses to the wards. In spite of the fact that the number of nurses per capita has risen steadily since 1890, and has doubled since 1950, there is a traditional cyclical lament about nursing shortage. Before and during World War I, for example, when the actual increase in the number of nurses peaked for the first time, there were recurrent, frequent worries about shortage. "Waning Nurse Supply in America" proclaimed the headline in a 1907 issue of the *National Hospital Record*. Right after the war, in 1921, Adelaide Nutting, a renowned nurse leader, worried about the "scarcity of applicants" in the *Proceedings* of the twenty-sixth meeting of the National League of Nursing Education. Five years later, with the supply of nurses still rising fast, the *Transactions* of the American Hospital Association decried the "paucity of nurses as one of the chronic ills of a hospital." But, by 1928, the professional literature was filled with stories of the nurse surplus and nurses began to swell the ranks of the unemployed. What was happening was a shortage of pupils in the hospitals caused by increased demands for hospital nursing care, and a surplus of

Dorothy Edlow, R.N., with patients on the Pediatric Ward, Hospital of the University of Pennsylvania, 1984.
Courtesy of the Center for the Study of the History of Nursing, University of Pennsylvania.

graduate nurses turned out by the training schools into a glutted private duty market. When, in the late 1930s, graduate nurses finally began to be employed in hospitals some of the surplus problem was alleviated. But students still provided much of the nursing care in hospitals so, from the hospital point of view, it was undesirable to cut back on their numbers.

There is an obvious consistency in this story. Throughout the entire history of nursing until the 1960s, Americans assumed that nursing should be a low cost service. Even when, after World War II, federal money began to be used to support the creation of a university-based educational system, dollars also went to hospital-based schools, guaranteeing a surplus of nurses at low salaries.

The story is still more complex. After all, people choose to work in health care for a mixture of reasons; and Americans support health care partially, at least, for altruistic reasons. Values, both explicit and implicit, enter into social decision making. Often indirectly expressed, values are difficult to deal with in current time, let alone historically. But how else can we explore the paradox of a society which frets over the shortage of nurses repeatedly for eighty years, yet still tries to get by with the same idiosyncratic system for

Dorothy Edlow, R.N., with the technology on the Pediatric Ward, Hospital of the University of Pennsylvania, 1984.
Courtesy of the Center for the Study of the History of Nursing, University of Pennsylvania.

preparing nurses for most of the century? Even now, neither nursing education nor nursing practice is adequately financed or fairly remunerated.

The Yo-Yo's String

If one face of the yo-yo is the set of priorities Americans hold about health care, and the other face is the assumptions Americans have held about nursing up until now, then the invisible hand, the force driving the yo–yo, is likely to be the changing American values that influence nursing over time.

In the nineteenth century, nursing was identified with growth, cleaning up the cities, reform by the so-called "earnest" classes, and improvement through the perfection of character.[6] Nurse reformers could envision a new, useful wage-earning role for women of educated intelligence. During this era of reform, nursing did well.

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6. Christopher Maggs, *The Origins of General Nursing* (London: Croon Helm, 1983). I am indebted to Maggs for his thoughtful discussion of the middle class reformers and their relationship to the development of nursing .

Of course the idea of education as a means to upward mobility and movement through the classes was not foreign to nurses. But the strategy operated in only a limited way for them since most were women and the very "femaleness" of nursing restricted its utility as a way up. Attaining upward mobility through education and career, the American dream, was a dream long delayed for most nurses. The present day residue of that delay is skepticism among the young regarding the long term wisdom of the nursing career choice. As we are seeing today, the cost of denying nurses upward mobility through education is the reluctance of aspirants to enter the profession.

Nursing has been very much caught up in the ebb and flow of American faith in science and technology. The highly technologically, aggressive interventionism so long characteristic of American medical practice still absorbs much of nursing's energy, as it has since physicians moved into the hospitals. With varying degrees of success, nursing has clung to its own nurturing, holistic attitude toward its clients. But, to this day, the siren song of cure sounds sweeter to Americans than the gentler refrain of comfort and care. It is the vacant positions in the acute care hospitals that raise the cry of nursing shortage, not the forty-to-one patient-to-nurse ratio in the nation's nursing homes. Nursing's own values are persistently underrated in our system which chooses to cure where possible and, where cure is not likely, to ignore the problem.

Any discussion of values in nursing must revolve around the issue of gender in American life. The feminist Lavinda Dock put it simply enough in 1920; "the status of nursing . . . depends on the status of women." Throughout its history, nursing as a discipline and as a profession has carried the weighty anvil of its femaleness. Ironically, however, nursing's femaleness would not matter if nursing were not so important. The vital role of nursing in relation to American health care priorities has led, in my view, to our reluctance to come to grips with the worth of its work. As long as women were willing to subsidize the development of institutions, high technology care and the care of the poor through low wages, Americans were free to expand these priorities at relatively low cost.[7]

The saga of techniques employed to avoid paying nurses for the nursing care we really want is a testimony to American ingenu-

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7. See Susan Reverby, *Ordered to Care: The Dilemma of American Nursing, 1850–1945* (New York: Cambridge University Press, 1987), for a complete discussion of this complicated and convoluted relationship.

ity. We have used pupils to care for patients instead of trained nurses. We have created turnover by refusing to employ married nurses. We have labeled women's wages "supplemental." We have allowed hospitals to fix wages in communities. We have excluded nurses from direct insurance-based reimbursement. And, most recently, we have argued that we cannot afford to entertain the concept of comparable worth. Throughout the history of nursing, Americans have not wanted to pay women what it costs to care.

Certainties and Likelihoods

At the end of the first one hundred years of American nursing, what can we learn from this account? Perhaps this is the place to make note of the resilience of nursing; though economically marginal, it continues to grow and diversify. Nursing, the work of actually taking care of other people, is fundamentally gratifying and engrossing. Like teaching or creating useful products, it is work that generates positive personal regard from others. Although the science and technology employed by nurses changes with new knowledge, the encounter between nurse and patient is perennially intimate and significant to both parties. It is work full of complications and emotional strain. Often intellectually difficult, it requires making important decisions with incomplete data. When nurses make mistakes, it is serious, not casual. Nursing, like domestic and agricultural work, may be disgusting and tedious. It can also be frightening when dealing with human beings under stress, out of control, in pain or near death. Both because of, and in spite of this importance, nursing attracts and holds very competent people in spite of its vacillating public image. This will continue to be true, no doubt, but currently the issue is one of the sufficiency and match between the demands of American society and the responses of potential nurses.[8]

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8. A sense of the complexity and intractability of the mismatch between supply and demand in nursing can be gained from perusal of recent health policy literature. Good examples are: Linda H. Aikens and Connie Mullinix, "Special Report: The Nursing Shortage: Myth or Reality," *New England Journal of Medicine*, 1987, *317*:641–646; Secretary's Report on Nursing, *Final Report* (Washington, DC: Department of Health and Human Services, 1988); Kenneth C. Green, "The Talent Pool in Nursing: a Comparative and Longitudinal Perspective," paper prepared for the *Nurses For the Future* Conference convened by the University of Pennsylvania School of Nursing and the Pew Charitable Trust in Philadelphia, PA, 28 June to 30 June 1987.

The demands are likely to be great, judging from past experience. Increased longevity among Americans will create a rising demand for caregivers for the chronically ill and the very old. Previous experience with devastating infectious disease warns us that AIDS will seriously challenge nursing's resources. The American public will continue to demand access to new technology in health care; management of that technology is, and will continue to be, nursing's domain. Though there is now much interest in care at home and more emphasis should be placed on the home care alternative, it is likely that the "institutional solution" will continue to be favored for major acute care as well as for the growing number of the very dependent chronically ill.

Given accelerating demands for nursing services, the exhausting of historic strategies for evading the issue, and current worries about declining enrollment in educational programs, the next few years will probably find Americans forced to face the cost of good nursing care. How we cope with that responsibility will be one of the leading stories of the second century of American nursing.

Essentials for the Future

People interested in nursing will have to come up with more compelling ways to promulgate the meaning and mission of nursing to both potential providers and consumers of nursing care. When nursing was new, it promised safe hospitals, health reform, clean, healthy babies and relief to families. Now, Americans are unclear about what it is that nurses promise to do; potential aspirants to nursing really don't know how nurses spend their days. The practice of nursing: personal care, support, education, and comforting assistance are hard to explain to a public with little personal experience of illness. Nursing's domestic origins tend to devalue its social contribution both to nurses and to the public. Part of the problem is the shared metaphors of science relied on by professionals and the public. Traditionally, nursing studied delivery systems, and techniques, instead of studying pain, response to illness, and the effect of knowledge on recovery. Nurses hesitated to study questions which did not seem to fit the scientific method; it is only recently that nurses again have begun to feel confident enough to articulate the basically moral, humane functions that are at the heart of caring for the sick.

Nursing needs and uses both the natural and social sciences; but these sciences are not enough. To convey the promise or mission of nursing in a way that society can grasp, nursing is now beginning to exploit the explanatory devices of all of scholarship. After all, most pressing health care problems that we face, such as care of the very old and care of AIDS patients, carry significant technological and moral choices. Nurses promise to provide those things that their patients cannot do for themselves. One of the things that many patients cannot do for themselves is to manage the health care system to their own advantage. Should the infant with AIDS in Newark lie in intensive care until the day of its death or should it be sent home to be sung to by its grandmother? Nurses take care of these choices but nobody knows it. Fully articulating the mission of nursing will require that nurses constantly explain and argue for person-centered health care and a place for nursing in policy formation. To the extent that nursing acts on its own broad mission, it will attract bright and active people to its ranks as participants.

The second essential task to assure a strong discipline in the future is to establish a reliable share of the health care dollar for the practitioner. Aspirants to nursing need to see *where* they will work and judge it to be good: good, from the viewpoint of mission, as outlined above, and good from the viewpoint of self realization in economic terms. This means that nurses need work systems that support nursing values and that offer a fair financial return. One promising strategy is the "nursing firm" or "nursing corporation" where nurses set up organizations capable of contracting nursing services to hospitals, home care agencies, industry and schools. These firms have the sole objective of assuring nursing care to patients; they have no obligation to the institution beyond patient care. Thus, the practitioner is employed in a system with a nursing goal and patient care priorities. Now that direct payment to nurses through third party payers is becoming a reality, nursing is drawing closer to its emancipation from hospital bondage.

The history of nursing is a history of conflicted loyalties where the nurse constantly juggles two sets of demands, those of the patients and those of the hospital. A long time ago, nurses worked directly for patients, in private duty. The problems of the private duty nurse have not yet been thoroughly studied, but it is safe to argue that she was driven out of business by a nursing surplus and hospital competition. I am not arguing for a return to the private

duty system, but rather for a return to a more accountable nursing care system where the dollar spent on nursing care goes directly to the nurse or her firm. The practice of a profession assumes that responsibility for the work done is personally accepted by the professional. Nurses will have a hard time keeping their promises to their public unless they practice in systems that share nursing priorities and values. Devising effective, reliable, economical systems for delivering safe nursing care in the myriad sectors of American society will be one of the most important tasks of the next twenty years.

Defining and preparing the responsible professional nurse is the third essential. This task is tightly linked to the two preceding tasks, for no general professional mission can be promulgated apart from the actions of its practitioners. And, no nursing firm can meet its obligations unless its members perform up to an understood standard shared in the group and acceptable to the public. Dean Carol Lindeman of Oregon Health Sciences University points out that the public defines nursing practice in terms of the nurses they know. As the public meets more nurses who both recognize and respond effectively to the needs of their patients, using the best of current information and skills, expectations of nurses will rise. The inescapable analogy is the improved public service offered by physicians as their training and skill repertoire began to improve after 1900. Admittedly, the care, comfort, and education services provided by a skilled nurse are more subtle and abstract to the consumer than a well performed appendectomy. Public acceptance and enthusiasm for nurse practitioners, nurse mid-wives, and psychiatric nurse clinicians, however, show the positive impact of the right service when it is well delivered.

What needs to be determined and made clear to the public, and to the potential nurse of the twenty-first century, is the standard of performance of the professional nurse. Assuring a reliable standard of performance requires careful selection, credible measures of attainment, and thorough clinical training; all will be difficult to sustain in the face of pressures to increase numbers. One of the lessons of the history of nursing is that quick fixes for shortages aggravate the long range problem by undermining the standard of performance expected by the public. Nurses, their supporters, and the public will have to be very clear about standards for professional practice if we hope to attract the best applicants in the 1990s.

History does not offer forecasting services adequate to the task of mapping out specific strategies to attract the best and the brightest

to nursing. What can be seen, however, is the necessary social function of nursing in our social systems. This look backward suggests some sense of the changes required if nursing is to continue to be the chosen discipline of a reasonable share of America's young adults over the next twenty years, thereby assuring ourselves of the nursing services we expect.

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Der Rote Schmidt: a Nineteenth-Century Model of Being Both Eminent Physician and Political Activist

WALTER J. LEAR

Physicians were well represented in the influential group of intellectuals and radicals who fled to the United States because of their ardent participation in the 1848 Revolution in Germany.[1] Ernst Schmidt was such a physician "Forty-Eighter." He emigrated to the United States in 1857, settling in Chicago where, for most of the years until his death in 1900, he practiced general medicine, played an influential role in radical politics, and served as an esteemed leader of the German-American community. He successfully combined highly productive careers as a citizen activist and as a health service professional. In addition, he maintained his integrity throughout his life as an idealistic, creative, and caring human being. For these reasons he was an eminent model for his peers, German-Americans and others, when both the nation and the medical field were undergoing enormous change.

This paper looks at Schmidt's lifetime experiences through his own eyes and through those of his contemporaries. Schmidt wrote extensive reminiscences when he was in his late-sixties, just before he died; these were translated and edited by a grandson, also a physician, Frederick R. Schmidt. Only a few of these trenchant and entertaining stories can be included here but they, and related

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A previous version of this paper was presented at the meeting of the Section on Medical History of the College of Physicians of Philadelphia on 19 October 1988.

1. Carl Wittke, *Refugees of Revolution: The German Forty-Eighters in America* (Philadelphia: University of Philadelphia Press, 1952); A. E. Zucker, "Biographical Dictionary of the Forty-Eighters," in A. E. Zucker, ed., *The Forty-Eighters: Political Refugees of the German Revolution of 1848* (New York City: Columbia University Press, 1950), pp. 269–357. Among Zucker's 300 plus Forty-Eighters, 37 were physicians, the third largest vocational group (the two largest vocational groups were journalists and soldiers); in Wittke's discussion of physician Forty-Eighters, he mentions ten not on Zucker's list.

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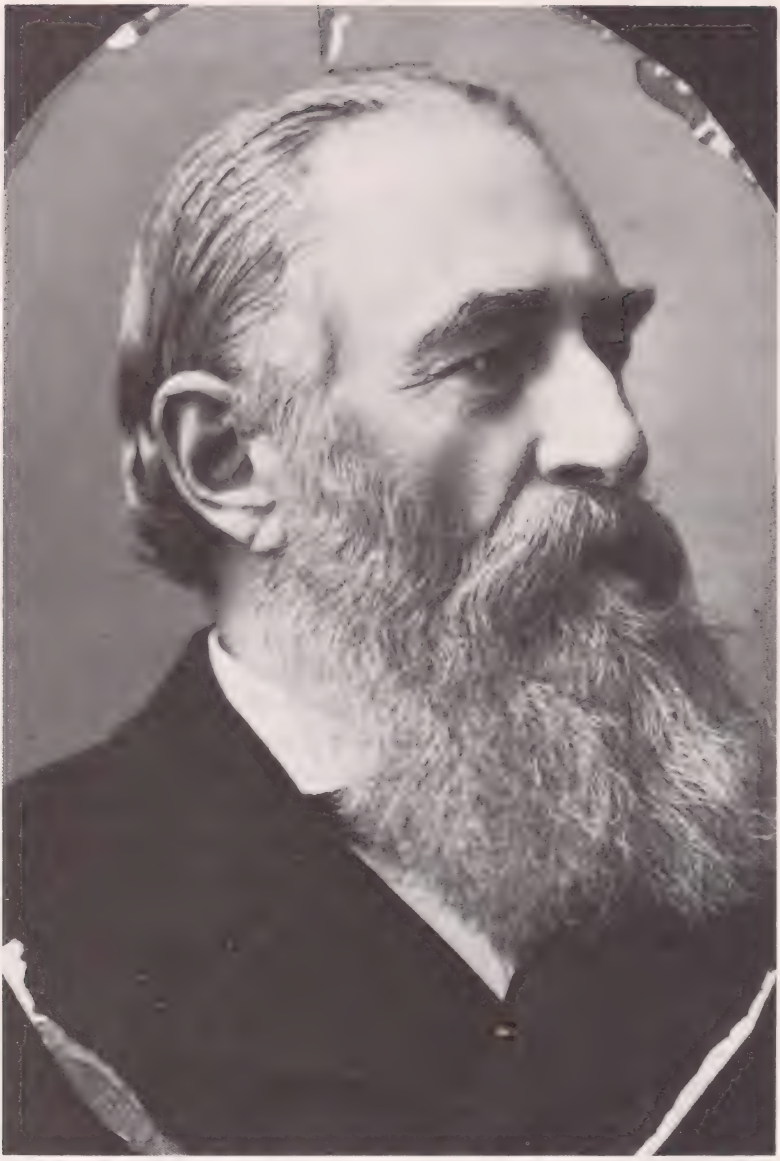

Ernst Schmidt (1830–1900).
Courtesy of Edward Schmidt Petersen, M.D., the great-grandson of Ernst Schmidt.

information, reveal the breadth and depth of the man, familiarly known as "Der Röte Schmidt."[2]

The Early Years

Ernst Frederick Felix Schmidt was born 2 March 1830 in the small Bavarian town of Ebern, near Bamberg. His father, a Roman Catholic, was an apothecary and later mayor of the town. His mother's father was a physician and his father's father was a blacksmith. His mother died when he was a child. He had five sisters and brothers. The family valued education, and Ernst Schmidt attended the Latin School of the Jesuit Fathers in Bamberg. Before graduating he spent considerable time with his maternal grandfather who, while studying medicine in Paris, had become a close friend of Jean Paul Marat and long afterwards continued to espouse Marat's extreme anti-authoritarian views.

Political radicalism was even more strongly promoted at the *Gymnasium* in Nürnberg where Schmidt studied next. A spirit of rebellion against the nobility and the church (Roman Catholicism in southern Germany) prevailed in the universities and this reached the boys in the *Gymnasium*. University and *Gymnasium* students shared the view that middle class offspring had less opportunity for higher education because admissions favored the families of the aristocracy and the clergy.

Support for radicalism and achievement was institutionalized in the *Turnerverein*, the popular gymnastic movement for boys and young men which demanded high standards of physical prowess, intellectual attainment, disciplined behavior, and political commit-

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2. Frederick R. Schmidt, ed. and trans., *He Chose; the Other Was a Treadmill Thing* (Santa Fe, NM: Frederick R. Schmidt, 1968). To a very large extent this book is comprised of selections of Ernst Schmidt's reminiscences (written in German) either in direct translation or in Frederick R. Schmidt's paraphrasing. Frederick R. Schmidt supplemented these with other information, mainly from a scrapbook about Ernst Schmidt compiled by his son Richard. The autobiographical manuscript and the scrapbook are in the Manuscripts Collection of the Chicago Historical Society. In the passages from *He Chose* which are indented, the words of Ernst Schmidt (as translated by Frederick R. Schmidt) are, as in *He Chose*, enclosed in quotation marks while the words of Frederick R. Schmidt in these indented passages are not. Other information about Ernst Schmidt without reference comes from *He Chose*. Items for which other sources are available refer to these other sources; this does not mean that these items are not covered in *He Chose*.

ment.[3] The Turners had no qualms about using physical force in behalf of their political beliefs; hence they made excellent soldiers and military leaders, as was demonstrated in the American Civil War and the Franco-Prussian War of 1870.

Schmidt was an exemplary Turner, as his grandson notes:

> Ernst, though only 17 years old in 1847, stood six-foot-three in his stocking feet and weighed 170 pounds — all muscle. Towering over most of his fellow gymnasts he never failed to thrill his companions by doing a difficult turn on the bars which he had learned from a book. In winter Ernst and his friends thought nothing of bathing in the icy waters of the Main.[4]

There was also a lighter and typically Germanic side to this student camaraderie.

> From the gymnasium . . . a path led . . . over . . . a footbridge to a small house half-hidden in a stand of pines. There the boys expressed their revolutionary ardor in patriotic songs of the day all the while consuming a good quantity of wine and *weisse Würstel*.[5]

The Clinician

Schmidt's decision to enter medicine after graduating from the Nürnberg *Gymnasium* is not surprising, given his youthful commitment to the welfare of the working people and given the strong medical presence in his immediate family. For his medical education, he went to the University of Würzburg, also in northern Bavaria, not far from Bamberg and Nürnberg. Following contemporary custom, he spent a semester or two in each of the Universities of Munich, Göttingen, Heidelberg and, for political reasons, Zurich. He graduated with high honors as Doctor of Medicine from Würzburg in 1852.

Among his notable teachers was Rudolf Virchow. In 1851 Virchow gave him a certificate for his "exceptional application and original thought" while participating in a special course in

3. Augustus Prahl, "The Turner," in Zucker, ed., *The Forty-Eighters,* pp. 79–110; Theodore Huebener, *The Germans in America* (Philadelphia: Chilton, 1962), p. 130.

4. Schmidt, *He Chose*, p. 42.

5. Ibid.

pathological anatomy.[6] Virchow also inspired Schmidt to study man in relation to his environment. And, of course, as Schmidt's grandson notes, the professor's socialist perspective reinforced the student's left politics. After graduating from medical school, Schmidt maintained a friendship with Virchow, their correspondence continuing almost to the day of Schmidt's death.[7]

After some post-graduate work in Prague and Vienna, Schmidt returned to Würzburg to assume duties as resident physician to his former psychiatry professor and as *Privatdozent* at the University Hospital. Because of his training, experience, and connections he believed it was reasonable to expect that he would have an important career in medicine.

Four years later Schmidt concluded that his strengths were not sufficient to overcome the onus of his radical past and contemporary views "in the reactionary Germany of that day." Any doubt about his being *persona non grata* was dispelled when he engaged in a duel with an army officer because of some derisive verses he wrote and published about a general. His influential faculty friends secured for him offers of lucrative positions in Egypt and Switzerland, but he rejected these in favor of alluring but unspecified opportunities of the United States.[8] His financial resources, probably supplemented by his father and/or his new wife, not only made such a risky change feasible, but enabled him to spend six months in London where he attended ward walks and dispensaries at Guy's Hospital.

Schmidt was no ordinary physician-immigrant. Shortly after arriving in Chicago, he became a leader and organizer. He joined with his close but senior medical colleague William Wagner, also a Forty-Eighter, in founding the German Medical Society; Wagner was elected the Society's first president and Schmidt its vice-president.[9]

At first his practice grew rapidly but in a short time he became controversial as a fighter against slavery. Schmidt recounts the situation as follows: " 'The campaign of defamation carried out against me by the proslavery partisans . . . soon reduced the number of my

6. Ibid., p. 77.
7. Ibid.
8. Ibid., p. 86.
9. Rudolf A. Hofmeister, *The Germans of Chicago* (Champaign, Il.: Stipes Publishing Co., 1976), p. 205.

paying patients. [By] 1859, I was left with 'free patients' only. Not being able to feed my little family on this patronage, I began to look around for a teaching position in another city.' "[10]

Schmidt soon found a post in St. Louis at the Humboldt Institute. Humboldt, the first German medical college in America,[11] had been established a few years earlier by another physician Forty-Eighter, Adam von Hammer. Here Schmidt taught anatomy, pathology, and forensic medicine — but not for long.

The impending Civil War polarized Missouri, as its Governor was strongly aligned with the South. Hammer, however, was one of St. Louis' staunchest supporters of the Union. In March 1861 (a month before the Civil War began) Hammer "organized and armed his students as a military unit; they hid in a near-by brewery, ready to fall on the rebels in case of an attack on the [Federal] arsenal. Upon the outbreak of war, he closed the [Humboldt] Institute and entered the Fourth Missouri Infantry as lieutenant colonel."[12]

Schmidt also volunteered immediately for military medical service and served in the Missouri infantry units which surrounded Camp Jackson, where the state militia were quartered. The rebels were forced to surrender, the Governor fled, and Missouri was saved for the Union.[13]

After some months Schmidt was forced to resign his Army commission because of ill health and return to Chicago.[14] His Army service helped to restore his reputation, and his practice thrived. He was appointed a demonstrator of anatomy at Chicago Medical College, a position he held from 1861 to 1863.[15] In 1865, on learning that his father was close to death, he returned to Germany with his family. He decided to remain in Ebern and obtained his medical license. A brother-in-law, the Minister of Interior at the Court of King Ludwig II of Bavaria, offered him two choice positions. Again he changed his mind, making his final commitment to America as he no longer felt at home in a Prussianized Germany.

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10. Schmidt, *He Chose,* p. 98.

11. Ella Lonn, "The Forty-Eighters in the Civil War," in Zucker, ed., *The Forty-Eighters,* p. 213.

12. Ibid.

13. Huebener, *The Germans in America,* p. 113.

14. *History of Medicine and Surgery and Physicians and Surgeons of Chicago* (Chicago: Chicago Medical Society, 1922), p. 15.

15. A. T. Andreas, *History of Chicago from the Earliest Period to the Present Time: Volume II, From 1857 Until the Fire of 1871* (Chicago: A. T. Andreas Co., 1885), p. 531.

On the ship back Schmidt met several Brothers of the Order of St. Alexis who were also headed for Chicago with the mission of establishing a hospital for the poor; the Order had a long history of providing nursing and institutional care to the insane and to medical outcasts in Germany and other European countries.[16] Schmidt's offer to help these German Catholic immigrants was accepted and, by the end of 1866, he and his colleague Wagner became the first medical staff of the new twenty-four bed hospital, a small frame structure built on land owned by the Roman Catholic Archdiocese. This institution, Chicago's first German hospital, grew rapidly and a succession of ever larger hospitals was built. The fourth, a 300-bed facility, was designed by Schmidt's architect son, while still in his twenties, and provided service from 1898 to 1966 when the current facility was opened in the Chicago suburb of Elk Grove.[17]

In 1869 Schmidt was officially appointed the "Consulting Physician" at the Alexian Brothers' Hospital and held that singular position until his death thirty years later.[18] He functioned as the hospital's medical director for its first decade or so, organizing and supervising the staff and providing care to hospital patients. When Schmidt's sons, Otto and Louis, became doctors they too joined the hospital's medical staff.

In 1866 he offered similar help to another Chicago immigrant community, the Jews. Initial funds for Chicago's first Jewish hospital were raised at a mass meeting: "The assemblage was addressed by Doctors Ernst Schmidt and Ralph N. Isham and the sum of $10,000 was subscribed on the spot."[19] Schmidt assisted the sponsor, the United Hebrew Relief Association, in developing the plans for a nineteen-bed hospital. When the institution opened in 1868, he was its first staff physician.[20]

This hospital, and the first Alexian Brothers' Hospital, were destroyed by Chicago's Great Fire of 1871. The Schmidts were

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16. Christopfer J. Kauffman, *History of the Alexian Brothers from 1789 to the Present: Volume II, The Ministry of Healing* (New York City: Seabury Press, 1978).

17. Gregory Isenhart, "History," (Elk Grove, IL: Alexian Brothers Provincial Archives, 1975).

18. 21 September 1988 letter from Donna Karl Dahl, Alexian Brothers Provincial Archives, to Walter J. Lear.

19. *History of Medicine and Surgery . . . of Chicago*, p. 85.

20. Lucy Freeman, *Hospital in Action: The Story of the Michael Reese Medical Center* (New York City: Rand McNally, 1956), pp. 24–25.

fortunate that their house escaped the conflagration. While the fire raged, Schmidt worked with thousands of other rescuers night and day to help save the people. He carried hundreds in his buggy from the path of the fire to the sandy shores of Lake Michigan. His eldest son Frederick, aged thirteen, assisted him in this rescue work by gathering and lining up women and children for their ride to safety.

Immediately following, Schmidt took on two relief responsibilities. First, he was one of a five-member committee of physicians which was established to provide support to physicians whose homes and offices were burnt out. About $11,000 was received and distributed, the largest amounts coming from New York City (Manhattan), Brooklyn, Philadelphia, St. Louis, Cincinnati, and San Francisco.[21] Second, he was one of nine persons comprising the Committee on Sick, Hospital and Sanitary Measures of the Mayor's relief organization; this was administered by the Chicago Relief and Aid Society. The medical committee created five geographical districts that supervised the medical care, distribution of medicines, and sanitary conditions of their respective areas. This special relief organization functioned for about six months.[22] For some years afterwards Schmidt continued to assist the Chicago Relief and Aid Society on hospital and sanitation matters.

During the 1873 cholera epidemic, Schmidt provided free care to those who contracted the disease. At the request of the Chicago Board of Health he mapped the cases of the disease. In 1873 he and three other German-American physicians formed the German-American Dispensary Society.[23] Members contributed money to buy medical supplies for German doctors who provided free care to poor ambulatory patients. This enterprise ran into financial difficulties and ceased in 1887.

When Michael Reese died in 1878, his nephews in Chicago were charged with dispersing part of his large fortune to suitable Chicago charities. Schmidt and Dr. Michael Mannheimer persuaded them to allocate much of it for building a new Jewish hospital. Then Schmidt "took an important part in planning the first Michael

21. Andreas, *History of Chicago: Volume II,* pp. 539–540; George H. Weaver, "The Chicago Medical Relief Committee," *Bulletin of the Society of Medical History of Chicago,* 1922, 2:334–342.

22. "Sick, Sanitary and Hospital Measures," in *Report of the Chicago Relief and Aid Society of Contributions for the Sufferers by the Chicago Fire* (Chicago: The Society, 1874), pp. 211–215; "Editorial: The Great Fire Medically Considered," *U.S. Med. & Surg. J.,* 1872, 7:208 -212.

23. *History of Medicine and Surgery . . . of Chicago,* p. 85.

Reese Hospital;"[24] this seventy-bed facility was completed in 1882. Schmidt was appointed to the Hospital's first medical staff which consisted of six physicians; in 1893 or 1894 his title was changed to "Consultant." He also served on the Hospital's five-person board of directors (the Hospital Committee of the United Hebrew Relief Association) from its inception to 1890. When he died the Hospital's Board noted that he had "served the Hospital with tireless devotion and matchless skill as a surgeon. He had won the admiration of his associates, the love and reverence of the officers and trustees, and the undying gratitude of thousands spared to life and [of their] loved ones by the ministrations of his genius."[25] At both the Alexian Brothers' and Michael Reese hospitals, Schmidt devoted his time to care of the poor; the sanitary and safety conditions of the factories and shops where they worked was also of interest to him.[26]

Schmidt identified with the working people even though, as stated in his obituary in the *Journal of the American Medical Association* and the *Chicago Medical Recorder*, "he was one of the most prominent medical men of Chicago."[27] Clarence Darrow, in his remarks, noted that Schmidt "used his great knowledge of medicine and people solely for the good of suffering mankind and not like some other famous physicians to fill his pockets with gold."[28]

A story in a tribute to Schmidt's son Otto, by Henry Horner, then Governor of Illinois, illustrates Schmidt's efforts to educate his patients.

> Dr. Ernst Schmidt in his lifetime was one of the most respected physicians and citizens of Chicago. Younger members of our family fought for the honor of ushering him in when he made professional calls at our home in Chicago. I recall a scene some forty odd years ago [about 1896, when

24. Carl A. Erikson, "Michael Reese at Fifty: A History of the Physical Development of a Famous Chicago Hospital," Reprint from the *Modern Hospital Year Book* for 1931 (Chicago: Schmidt, Garden & Erickson, Architects, n.d.), p. 26.

25. 10 October, 1988 letter from Archivist David Burns, Michael Reese Hospital and Medical Center, to Walter J. Lear; Sarah Gordon, ed., *All Our Lives: A Centennial History of Michael Reese Hospital and Medical Center, 1881–1981* (Chicago: Michael Reese, 1981), pp. 4, 24, 31, 63, 198; Schmidt and Manheimer had the additional role of the admitting physicians, ibid. pp. 23–24.

26. Paul Gilbert and Charles Lee Bryson, eds., *Chicago and Its Makers* (Chicago: Felix Mendelsohn, 1929), p. 638.

27. "Deaths and Obituaries," *JAMA*, 1900, 35:574; "News Items," *Chicago Medical Recorder*, 1900, 9:203.

28. Schmidt, *He Chose*, p. 29.

> Horner was seventeen years old] in the sick chamber of my esteemed and much beloved grandmother, when Dr. Ernst Schmidt called professionally to attend her. My grandmother inquired, 'Tell me Doctor, what is wrong with me?' The tall figure of the stately doctor remained motionless, his face showed deep study, and then he said: 'Frau Horner, if we could put a little window in your abdomen so that we baffled physicians could look inside, I might be able to answer your question; . . . science and its devotees will invent one, and it won't be long before that discovery is made. Then we physicians won't have to guess so much.'[29]

A tribute published shortly after Schmidt's death by Rabbi Emil Hirsch, then the leader of Reformed Judaism in Chicago, a trustee of Michael Reese Hospital, as well as a good friend of Schmidt, provides additional insight on his medical teaching role, which was largely informal. "Many a younger physician owes [to] 'good, old Doctor Schmidt' the inspiration which led to the choice of his profession. To the last [he] remained a friend of his younger colleagues. Without envy, delighting in their success, he aided them with counsel and cheered them with his example and sympathy."[30]

The Political Activist

Schmidt's profound humanitarianism was only partly expressed in his medical work; his political career began before he entered medicine. In 1847, while still at the Nürnberg *Gymnasium*, he met the leading Bavarian radical of that time and became his assistant. For the following year and a half his political activities rapidly increased in intensity and responsibility, despite the demands of his university studies.

He was appointed co-editor of *Der Neue Frankische Zeitung* in Würzburg. He was elected one of the three delegates from Lower Franconia on the nine-member executive committee of the People's Revolutionary Union of Franconia. In addition, there were committee meetings, weekly reports to his political chief, and the frequent rallies; as his grandson recounts, "Ernst found himself addressing gatherings of as many as three or four thousand men and women,

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29. Henry Horner, "Appreciation of Dr. Otto L. Schmidt," *Jahrbuch der Deutsch-Americanischen Historischen Gesellschaft von Illinois* (Chicago: Der Gesellschaft, 1937), p. 20.

30. Schmidt, *He Chose*, pp. 184–185.

preponderantly peasants, students, industrial workers and intellectuals of all classes of society."[31]

After the failure of the 1848 Revolution, the "People's Uprising," Schmidt was one of the hard core who, still hoping to regain power, kept on fighting. His last revolutionary act was leading a street demonstration in his home town in the summer of 1849. As a result he had to flee to Zurich where he resumed his medical studies at the University. The following winter he returned to Würzburg as the King had granted to all those under age twenty-two an "Amnesty for the Misled."

Like other Forty-Eighters, Schmidt put his hopes for a better world in an America

> free from Europe's interminable political chicaneries and the many shackles on the people's freedom. America was a land offering social justice and free education, neither of which were yet to be found in Germany, even after so much blood had been shed to bring them about. Furthermore, the American Constitution maintained the doctrine of separation of state and church. This was another goal for which German youth had fought and died, to no avail in their rebellion against Crown and Altar.[32]

After his arrival in Chicago in 1857, Schmidt found the radical cause which launched his political career in the United States and was a "natural" for all the Forty-Eighters. He considered it a " 'privilege to participate in the so-called Underground Railroad,' "[33] and he spoke publicly and vigorously against the injustice of slave labor, often suffering violence at the hands of mobs.

He became an admirer and friend of John Brown:

> A few weeks before he was hanged . . . the bearded martyr presented me with his autographed photograph which I regard as one of my most precious possessions. On the evening of 2 December 1859, the day of his execution, I made a speech before a handful of John Brown's followers at Kinzie Hall. A proslavery mob had gathered outside and, after my talk, followed me down the street, shouting, 'Lynch the red-haired Dutch bastard!' Mayor Milliken offered a strong police escort

31. Ibid., p. 44.
32. Ibid., p. 86.
33. Ibid., p. 93.

> to conduct me across the Clark Street Bridge to the North Side, but I preferred to walk across alone. The mob, assembled at the south end of the bridge, did nothing more than indulge in some beastly howling.[34]

In 1860 Schmidt campaigned to elect Abraham Lincoln President. He and Richard Yates, then Governor of Illinois, stumped the state on horseback, the Governor speaking in English and Schmidt speaking in German, extolling the principles of equality and freedom for all citizens of the Union. This kind of support from the Forty-Eighters drew the bulk of German-Americans out of the Democratic column and into the new Republican column despite the Democrats' friendlier attitude towards immigrants.[35]

> For his aid in helping to elect Lincoln, he neither requested nor accepted a reward in the form of public office, greatly surprising the President at his inaugural reception and causing him to ask of his entourage, 'Where is that big redhead from Illinois? He's the only one not begging me for a job.'[36]

However, a few years later when the position of Cook County Coroner was established, Schmidt did accept the Republican nomination for this post and was elected by a sizable majority. Six months later he resigned, claiming that political interference made it impossible for him to conduct proper examinations.[37] This he did despite a personal visit from Governor Yates who tried to persuade him to remain as Coroner.

By 1879 he was long estranged from the Republican Party because of the greed and corruption of northern Republican carpetbaggers and the pro-capitalist stance of the Republican Party of Chicago. In contrast, he found that the 1879 Democratic candidate

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34. Ibid., pp. 97–98.

35. Reinhard H. Luthin, *The First Lincoln Campaign* (Cambridge: Harvard University Press, 1944), pp. 185–187.

36. Schmidt, *He Chose*, p. 103.

37. Thomas N. Bonner, *Medicine in Chicago 1850–1950: A Chapter in the Social and Scientific Development of a City* (Madison, WI: The American History Research Center, 1957), p. 178. A somewhat different version is given in an anonymous biographical note written shortly after Schmidt's death: "People had elected him Coroner in 1864 without his support and on occasion urged him to use this office to rob bodies. Now Dr. Schmidt had no qualms about stealing bodies for scientific research, but the robbing of bodies was against his nature. He resigned his office and went to Europe with his family." This is translated from *Chicago und sein Deutschtum* (Cleveland: German-American Publishing Co., 1901–1902; reprint, "Dr. Ernst Schmidt, Chicago," *Deutsch-Amerikanische Geschichtsblatter*, 1903, 3(1):14).

for Mayor of Chicago, Carter Henry Harrison, Sr., had an understanding and sympathy for the worker. Schmidt concluded that he could best help break the Republican grip on the city's political life by running for mayor on the Socialistic Labor Party ticket. This he did energetically.

Despite vicious communist-baiting of both Harrison and Schmidt, and Harrison's initial poor chances of winning against the entrenched Republican machine, Harrison did win. He received about twenty-five and a half thousand votes to about twenty-one and a half thousand votes for his Republican opponent. Obviously Schmidt's twelve thousand votes, largely from Republicans, made the difference, thereby ushering in a long period of domination of Chicago by the Democratic machine.[38]

Schmidt often spoke at large radical political events, wrote extensively on political matters for German and other newspapers, and privately played an important go-between role in Chicago's political life. His last major political contribution was leadership of the support efforts for the anarchist labor organizers charged, tried, and convicted of murder in the Haymarket tragedy of 1886. In this international cause célèbre, six of the eight defendants were German-Americans.[39] Despite "the inflamed condition of the public mind" Schmidt fully invested his prestige, time, and organizing skills in the defense committee.[40] In response to the committee's appeal, widely reproduced in the liberal and labor press, contributions poured in from every state and many other countries, even India and Japan.

The next task was to find experienced, well-respected counsel for the defense. This proved to be difficult; fear of the consequences of being defense counsel of so unpopular a cause was justified, as later events proved. Schmidt himself was publicly castigated for undertaking the defense committee leadership; he even received threats against his life.

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38. A. T. Andreas, *History of Chicago: Volume III–From the Fire of 1871 Until 1885* (Chicago: A. T. Andreas Co., 1886), p. 865; *History of Medicine and Surgery . . . of Chicago*, pp. 86–87.

39. Paul Avrich, *The Haymarket Tragedy* (Princeton, NJ: Princeton University Press, 1984); Henry David, *The History of the Haymarket Affair*, 2nd ed. (New York City: Russell & Russell, 1964). The description of Schmidt's role in the Defense Committee in these scholarly accounts and in Schmidt's reminiscences are completely consistent; in fact, Avrich frequently uses *He Chose* as his primary source about Schmidt.

40. Schmidt, *He Chose*, p. 146.

He summed up his view of the trial as follows:

> When it became clear that the defendants could not be proved guilty of the charge on which they had been indicted, namely, of having thrown the bomb that killed Officer Degan, the prosecution suddenly changed its tactics. It was in the middle of the trial that the great defender of property and usury, State's Attorney Grinnell, switched to the charge of anarchy, repeatedly shouting, 'Anarchy is on trial!' And it was on this charge of anarchy and not on the original charge of throwing the bomb that the eight labor agitators were convicted.
>
> On a hot sultry afternoon as the trial was drawing to a close, I was sitting in the visitors' section trying to pay attention to what Grinnell and Black, the two opposing attorneys, were saying in their summation. As for Grinnell, it made no difference what he said because he was already assured of a conviction on his outrageous charge of anarchy.
>
> I had had two difficult breach deliveries the night before and found myself dosing off repeatedly. During one of my waking moments I heard Black's rich voice rising as he expatiated on the prosecution's failure to prove the charge in the original indictment, the charge of having killed Officer Degan.
>
> Suddenly awake, I barely refrained from jumping up and shouting, 'Black! Tell them you know the trial is rigged. A travesty on justice, that's what it is. I tell you, Black, there's no use going on. It's all over. This trial is a court-martial like the one in 1849 when the Prince of Prussia murdered hundreds of Germans, many of them boys in their teens.'[41]

The Haymarket tragedy of 1886 contributed greatly to Schmidt's political disillusionment; he realized that his land of youthful dreams, America, "was being sullied by rogues and politicians" and had become no better or worse than the Europe he had fled.[42] Unlike many of his politically successful peers, Schmidt did not modify his views to fit the dominant optimism of the Gilded Age in America. One statement about war, in his reminiscences, illustrates his political consistency and integrity into the very last years of his life, as well as his prophetic powers:

> The [1899 Hague Peace] conference came to an end like all such disarmament conferences, without producing tangible

41. Ibid., pp. 145–147.
42. Ibid., p. 175.

> results. Nothing was accomplished toward outlawing war. So it will be until war is made impossible by the very weapons with which it is waged. The machines of destruction will some day be developed to such an extent that they will be able to destroy instantly entire armies, the most 'invincible' forts and even the largest cities. Then even the most false indoctrination and propaganda will be ineffective. People will refuse to let themselves be dragged to the slaughterhouse. The Great Powers talk peace and make war, ever with an ear turned to the voices of lobbyists for heavy industry.[43]

His overall political perspective is best summarized in the following statement:

> As long as I can remember, I have always fought with all my strength against our social structure built on the oppression and exploitation of the poor and defenseless, declaring without reservation that the mere doctoring of this run-down 'order' will not help. It must be thrown overboard, the good and the bad, if ever we can make room for a new and just society.[44]

Despite the many discouraging failures of the political system of Chicago and the nation, Schmidt never gave up hope that the people would eventually win their full democratic rights and opportunities. The early socialist leader Morris Hillquit, describes Schmidt as "a popular and influential German physician, a noted Marxian scholar, and a steadfast friend of labor."[45]

Other Aspects of Schmidt's Life

Schmidt was more than just a clinician and political activist; he was deeply involved in an unusually wide range of personal, cultural, and intellectual activities.

Shortly before leaving Germany in 1856, Schmidt married Teresa Hildegarde Weikard, a devout Roman Catholic, whose father was a magistrate and whose grand-uncle was a well-known physician. They had two sons who were highly regarded and influential Chicago physicians, a third who became a prominent Chicago architect specializing in hospital architecture, and a fourth who was a druggist and proprietor of several drug stores.

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43. Ibid., pp. 176–177.
44. Ibid., p. 109.
45. Morris Hillquit, *History of Socialism in the United States*, 5th ed. (New York City: Dover Publications, 1971), p. 238.

Schmidt was a man of words — an orator, writer, editor, linguist, translator, and literary scholar. From the People's Uprising of 1848 to the dedication of the monument for the Haymarket martyrs in 1893,[46] he gave stirring addresses to crowds of thousands, speaking easily in German, English or both as the occasion required.

In addition to writing for newspapers, he undertook editorial and publishing responsibilities.[47] He knew Latin, Greek, and Hebrew and produced successful German translations of classic literary masterpieces, including a drama by Aeschylus. He was so fluent in Latin that at the memorial service for his colleague Wagner he switched to Latin because his remarks in English and German had failed to move the mourners.[48]

His German translations of Longfellow's *Morituri Salutamus*, Poe's *The Raven* and Markham's *The Man With the Hoe* were particularly well known. From Longfellow and Markham he received highly laudatory letters; Markham also noted, "I am deeply touched to hear that it was from your sick bed that you multiplied my voice — that even the hand of illness could not deaden the beat of your heart, keyed as it is to the enthusiasm of humanity."[49]

He was a sociable person; as much as any German-American he enjoyed the beer hall/saloon: the discussions, the singing, and the *Gemütlichkeit*. And as a community leader, he was a good supporter of Chicago's German choral societies and theater groups. Schmidt had other artistic interests and talents. He wrote many poems and songs with a wide variety of subjects, sometimes humorous, sometimes serious, often to express his feelings about a person or event. He was a connoisseur of Roman antiquities. He had considerable potential for painting; his scrapbook is filled with respectable watercolors. Last, but not least, faithful to his artisan family

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46. Irving S. Abrams, "The Haymarket Tragedy; Part I–Pioneer Aid," *Anarchist Weekly Freedom*, 1972, *33*(46):4.

47. In 1863 he was the editor and proprietor of a short-lived German language newspaper called *The Chicago Telegraph*; Franklin William Scott, *Newspapers and Periodicals of Illinois 1814–1879* (Springfield, IL: Illinois State Historical Society, 1910), p. 79. Ten years later he says he launched *Vorbote*, another German language newspaper; Schmidt, *He Chose*, p. 119.

48. Schmidt, *He Chose*, pp. 111–112.

49. Ibid., p. 174.

heritage, "he was proudest of his craftsmanship as a cabinetmaker of which he once remarked in his ironical way, 'It makes a person happy to know he can, if necessary, make something useful.' "[50]

Following several years of retirement from medical practice due to illness, Schmidt died in his upper-class home in the near North Side of Chicago on 28 August 1900. In keeping with his atheistic convictions, he was cremated without religious ceremony. Instead Schmidt was honored at a massive public tribute: "Thousands of men, women and children, rich and poor, jammed the North Side Turner Hall and the streets around it to overflowing . . . to pay last respects to Dr. Schmidt. The speakers were many, including ex-Governor John Peter Altgeld of Illinois and Attorney Clarence S. Darrow."[51]

Altgeld, in his tribute, concluded: "The choicest political plums . . . and more he refused, declaring that he would always remain with those who have no portion of the happiness of this world. This is what made the man so great, what marks him from the others: that he felt with the people, laughed with them, cried with them, and, not seldom, dried the tears of the poor."[52] Or, as expressed by his close political colleague, the Chicago labor leader George Schilling, "He has chosen to . . . remain the steadfast friend and companion of 'the man with the hoe.' "[53]

But it took another German-American, Rabbi Hirsch, to provide, in his florid romantic style, a more fundamental characterization of this mid-nineteenth century immigrant whose mind was as powerful as his body, whose politics were as red as his beard, whose being "recalled the heroic mold of the valiant dwellers of Valhalla whose mightiness and majesty German song and myth have loved to 'singen und sagen.' A very Siegfried in his younger days, to the . . . threshold of the eighth decade of life he retained the erect carriage, the elastic step, the forceful appearance of one who shared with the oaks of the German forests, conquering control over time's onslaught."[54]

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50. Ibid., p. 175.
51. Ibid.
52. Ibid., pp. 180–181.
53. George Schilling, "Dr. Ernst Schmidt — For 'The Public,' " typescript, 1899, p. 2, Manuscripts Collection, Chicago Historical Society, Illinois.
54. Schmidt, *He Chose*, p. 182.

Conclusion

Even this summary account of Schmidt's life establishes his importance both as a highly respected clinician and influential left political activist. But his story tells us something more; it crystallizes the fundamental character of this nation in the second half of the nineteenth century from the perspective of German immigrants and, unquestionably, of many other Americans as well. Despite his personal prosperity and high social status, Schmidt never lost sight of the difficult, often tragic, lot of a large proportion of the working people. For them it was a land of broken dreams, rife with injustice, corruption, violence, health hazards, crippled opportunities, and economic exploitation. Their dreams were his dreams; their disillusionment, his disillusionment. The clarity and stability of his youthful democratic (then revolutionary) ideology served until the turn of the century as a conspicuous, reproving measure of what these Americans believed this nation should have been but was not.

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America's Wellness Policy and Health Promotion

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Eliminating smoking; reducing alcohol use and calorie, fat, salt, and sugar intake; obeying speed laws; using seat belts; exercising moderately; and getting regular medical checkups will save lives, improve their quality, and be economical — according to Joseph A. Califano, Jr., the Secretary of the U.S. Department of Health, Education and Welfare. On 26 July 1979, Mr. Califano formally adopted "wellness," the concept of optimum physical and mental health, as government policy in order to counter rapidly rising medical costs and pressure for national health insurance, and as a means of applying the growing evidence that links behaviors with disease. The current federal goals for wellness for the year 2000 are to reduce death rates for people less than sixty-five years old by twenty to thirty percent, and to improve the health and mobility of the elderly.[1]

Similar optimism appears in the private sector's marketing of wellness. Television shows and videotapes offer the promise of longer lives and trimmer, healthier bodies. Stores sell exercise equipment, health foods, medicines, and health magazines. Exercise clubs shine with glittering equipment and instructors. Corporate giants like Metropolitan Life and Johnson and Johnson market promotion packages to General Motors and smaller companies.[2] Harvard, Stanford, other universities, and the Family Health Foundation of America set up health information programs and hold conferences on wellness.

Wellness, sometimes called health promotion, health maintenance, or disease prevention, seems to be everywhere and will allow many of us to live longer, better lives. Unfortunately, the search for wellness carries with it some serious problems that need to be addressed. After briefly describing achievements, we present the

1. DHEW (PHS) Publication 79-55071, *Healthy People: The Surgeon General's Report on Health Promotion and Disease* (Washington, DC: USGPO, 1979).

2. M. R. Greenberg, ed., *Public Health and the Environment: The United States Experience* (New York: The Guilford Press, 1987).

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pitfalls of wellness and describe their implications for health care professionals.

Achievements of Wellness

Prevention was responsible for an unprecedented increase in life expectancy during the first half of the twentieth century. In 1900 the average lifespan was forty-seven years because infectious diseases — pneumonia, influenza, tuberculosis, diphtheria, and gastroenteritis — annually killed 579 out of every 100,000 people. Water and sewage treatment ended the massive epidemics that had devastated North America and Europe. Increases in agricultural production prevented famines, and better nutrition protected against debilitating infections and parasites. Medical science contributed immunizations and antibiotics that, combined with public health measures, all but eliminated diphtheria and tuberculosis, and stopped most infections before they became fatal. By 1950, pneumonia and influenza were the only remaining communicable diseases among the ten leading causes of death in the United States. The overall death rate fell and the average lifespan reached sixty-eight years.[3]

While prevention had a dramatic effect on increasing lifespan during the first half of this century, gains since 1950 have been more modest. Currently the leading causes of death — chronic heart diseases, cancer, stroke, arteriosclerosis, diabetes, and liver cirrhosis — are more resistant to prevention's efforts than were infectious diseases. Gains, not only in lifespan, but in general health and mobility, are now being realized more slowly because determining true risk factors and changing high risk behaviors are lengthy and difficult procedures, the results of which are not necessarily evident for many years.

For example, smoking is now considered the single most important preventable cause of premature death. It accounts for thirty percent of cancers, twenty-five percent of heart diseases, and countless other maladies.[4] In the 1930s, health scientists first found evidence that smoking tobacco reduced lifespan. Repeated studies and

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3. Ibid.; H. D. Trowell and D. P. Burkitt, *Western Diseases: Their Emergence & Prevention* (Cambridge, Massachusetts: Harvard University Press, 1981); National Center for Health Statistics, DHHS (PHS) 82-1232, *Health–United States 1981* (Washington, DC: USGPO, 1982); DHEW, *Healthy People*.

4. R. Doll and R. Peto, *The Causes of Cancer* (New York: Oxford University Press, 1981); DHEW, *Healthy People*.

dence that smoking tobacco reduced lifespan. Repeated studies and millions of dollars on advertising against smoking have reduced the number of smokers — thirty percent of men and twenty-four percent of women were smokers in 1987, the lowest percentages on record. The rewards for these efforts — substantially lower death rates and improved general health of the population — may not be clear until the turn of the century.[5]

Similarly, scientists have found links between heart disease and diet; alcohol abuse and cirrhosis of the liver; seatbelt use and fatal auto accidents; and moderate exercise with improved health and mobility. Diets are changing, more people exercise and use seatbelts. Campaigns against drinking and driving have been launched — as witnessed by the efforts of M.A.D.D. (Mothers Against Drunk Drivers) and S.A.D.D. (Students Against Drunk Drivers). The results of these efforts to achieve lower death rates and wellness should be measurable within a decade.

Early detection of abnormalities by physicians is another way of preventing premature death and debilitation. Data from the National Health Surveys of the National Center for Health Statistics show that more people are being tested for cervical, colon and breast cancers, hypertension, and heart disease. For example, the percent of adults over forty who had an electrocardiogram increased from sixty percent in 1973 to seventy-six percent in 1982. Breast examinations and pap smears were reported by seventy-five percent of women age seventeen or older in 1973, compared to ninety percent in 1982. These figures show that the public is responding to screening programs, and are more aware that early detection can save lives.[6]

Awareness that health can be affected by the environment is also bringing about changes in the way the public approaches wellness. Earth Day in 1970 and its two-decade aftermath have made it clear that the vast majority of Americans will no longer tolerate indiscriminate water, air, and land pollution. Laws have been passed that not only control outdoor pollution, but also affect our indoor environments as well. Today, smoking is restricted in public places

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5. "Smoking: after 20 years still the public health challenge," *The Nation's Health*, February 1984, pp. 1 and 6; "Treating Tobacco Dependence," *New Jersey Medicine*, February 1988, special issue.

6. D. A. Dawson, G. E. Hendershot, and B. Bloom, "Trends in routine screening examinations," *American Journal of Public Health*, 1987, 77(8):1004–1005.

and some states require seatbelts. Workers and communities have been granted the right to know what chemical, biological, and physical hazards they may encounter. Corporations are labelling their products and changing processes so that dangerous pollutants are not produced. Worker exposure to hazards has been reduced and progressive corporations have begun promoting workers' health and fitness programs. These changes will lessen exposure to hazardous substances and improve safety conditions for both workers and the general public, the result of which should be a healthier population.

Prevention's Pitfalls

The impressive public health achievements of the first half of the twentieth century are obvious, and the medical advancements of the recent past are undeniable. Yet continued progress toward wellness requires buttressing the scientific facts behind health promotion and improving the flow of accurate information to the public. Physician and health scientist input is mandatory in order to distinguish true wellness measures from commercial gold-digging. It also requires controlling the urge of the public to reject medical care they don't consider holistic, and requires health care professionals not to castigate people who cannot or will not achieve wellness on their own behalf.

Premature Appeals to Change Behaviors

Objectivity and caution are drummed into physicians' and scientists' heads. Unfortunately, the need for grants and promotions — as well as the media's propensity to dramatize and oversimplify — leads to frequent premature exhortations to the public to change behaviors. We say premature because many recommendations are based on inconclusive findings. During the last decade, controversies have raged over the following: mammographies, colon examinations, vitamin therapies, fiber, cholesterol, cyclamates, aerobics, infant formulas, coffee, and swine flu immunizations, to name but a few.

Two examples will illustrate how the public is presented with confusing recommendations and, as a result, consider many medical claims to be without merit. President Ronald Reagan had a physical in March of 1985. Four tests looking for blood in his stool were performed in order to rule out cancer of the colon. Two of the tests were positive and two were negative. Since the test results can be

made and all were negative. The President actually had a tumor in his cecum. If Ronald Reagan were an ordinary citizen, he might by now have developed a fatal tumor while assuming his colon was clear.

No one debates the point of detecting a colon cancer quickly; early detection greatly increases the probability of survival. The problem is test reliability. Tests for cancer of the colon — blood in the stool, digital rectal exams, colonoscopy, and biopsy — have undergone extensive clinical trials, but results are not definitive. Stool blood is often used for screening because it is inexpensive. Unfortunately, it produces many false positives and negatives. In fact, the vast majority of positives on this test (ninety to ninety-five percent) are false. On the other hand, positive test results cannot be ignored and the entire colon must be examined. This means either a barium enema or a sigmoidoscopy at a cost of $300–900. At these rates, full colon evaluation for the entire population would run about $1 billion.[7]

False negatives, like Ronald Reagan's, range from twenty to fifty percent in different studies. The bottom line is that false positives cost a great deal of fear, inconvenience, and money. False negatives, however, may cost lives. Should the test be recommended to the public? The American Cancer Society and National Cancer Institute say yes. Many physicians and scientists say no. The public is left without a clear message on this matter.

Along the same lines, there exists a long-standing controversy over the diet-cancer link. In 1977, George McGovern piled 100 pounds of lard, 300 cans of soda pop, and 125 pounds of sugar (the typical American's annual consumption) into a hearing room to announce the publication of *Dietary Goals for the United States*. His Select Committee on Nutrition told Americans that they would live longer if they cut back on sugar, salt, cholesterol, fat, and ate more fruits, vegetables, and whole grains. Government funding of nutrition research jumped from $50 million to $170 million during McGovern's chairmanship of the nutrition committee. More money has simply meant more controversy, however, as the premature release of research results has been transmitted to the public.[8]

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7. G. Kolata, "Debate over colon cancer screening," *Science*, 1985, 229:636–637.

8. W. J. Broad, "New strength in the diet-disease link?" *Science*, 1979, 206:666.

The controversy over artificial vs. natural foods, for example, illustrates how confused the public must be about nutrition. Publications such as James Turner's *The Chemical Feast* and William Serrin's "Let Them Eat Junk" in an 1980 issue of the *Saturday Review* admonish the public to abandon fast-food restaurants, highly processed foods, convenience and snack foods, and anything with artificial food additives and preservatives. These items, they claim, lead us to cancers, heart, and other diseases.[9]

Scientific evidence shows, however, that artificial food additives and preservatives cause less than one percent of cancers, and some may actually decrease cancers because of the possible protective effect of antioxidants and other preservatives. To further complicate the message, many natural foods are now claimed to be more unhealthy than processed ones. Bruce Ames of Stanford University argued that we eat at least 10,000 times more naturally occurring pesticides than man-made ones.[10] Naturally occurring carcinogens do not fire the media as do artificial ones with scary names such as ethylene dibromide or trichloroethylene. The result is that the public is inaccurately informed of what we really do and do not know.

The Prevention Gold Mine

While physicians and health scientists struggle to isolate a few facts they can agree upon, and underfunded health educators test ways of delivering their messages, health promotion has become a huge business. In one week in September 1987, *TV Guide* listed 132 programs on health and fitness. The Princeton, N.J., Public Library had more than 250 do-it-yourself diet, exercise, nutrition, and vitamin therapy books on its shelves, nearly all post-1980. One of the town's video stores listed 101 available exercise tapes and forty-five others on such topics as diet, stress, and quitting smoking. According to consultants to *U.S. News and World Report* on 7 September 1987, the number of health magazines and newsletters was up from twelve in 1982 to eighty in 1987, and only about half offered valid information. Many of these periodicals carry advertising for products no one needs and drugs not approved by the U.S. Food and Drug Administration.

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9. W. Serrin, "Let them eat junk," *Saturday Review*, February 2, 1980, pp. 17–23; J. Turner, *The Chemical Feast* (New York: Grossman Publishers, 1970).

10. B. N. Ames, "Dietary carcinogens and anticarcinogens: oxygen radicals and degenerative diseases," *Science*, 1983, *221*: 1256–1266.

Our local supermarkets and drug stores had more than two dozen health magazines. Some of these include *American Health, Better Health and Living, Diet and Exercise, Exercise, For Men Only, New Body, Prevention, Self,* and *Shape.* All of these magazines had at least one article on topics such as vitamins and minerals, exercise, obesity, cancer, and steroids. Some of the articles contained first-person accounts of miracles achieved by exercising, using a drug, or some other therapy. These articles read like romantic novellas rather than sound, scientific advice but the public absorbs these stories like gospel.

In general, popular periodicals on health care, diet and exercise report the extremes. They frequently raise expectations too high or, conversely, are too critical. For example, exercise, fiber, and vitamins A and C are touted in these publications as ways of preventing cancer. The National Cancer Institute has recommended foods that increase Vitamins A and C, and worked with a food-producing company to advertise fiber. Yet, recommended levels of these nutrients in the diet are steadily decreasing. A National Academy of Sciences committee was about to publish a report in 1985 that further lowered the recommended daily allowances of these when scientific and political controversy broke out over what should be recommended. As a result, the report was not published.[11] Although the established recommendations continue to be reported to the public in unequivocal language, they remain highly debatable. In the meantime, millions of dollars continue to be spent on unnecessary vitamin, mineral, and fiber pills, and the testimonials concerning their worth continue to sell magazines.

Advertisers blatantly combine the images of sex and youth to sell items that have something to do with health (treadmills, weight-lifting equipment, running shoes, and braces for knees and ankles so we won't have to miss a workout). These images are also used to sell items that help self-image (jeans, perfumes, skin creams and soaps, exotic make-up, hair transplants and other cosmetic surgeries, and thrill-seeking vacations) and those which can actually do physical harm (home tanning equipment). Some advertisers even promise that, with their wonder drugs and treatments, you can continue your current diet and life-style and still correct the health hazards from cholesterol, high blood pressure, stress and, of course,

11. "Nutrition report and the Academy," *Science,* 1985, *230*:1324–1326, 1410.

smoking. Physicians see these types of patients routinely — the ones who demand a quick fix for their lifetime of unhealthy behaviors.

The most outrageous manipulator of health promotion in the United States is the cigarette industry. As required by the U.S. Surgeon General, cigarette advertisements now say "smoking causes lung cancer, heart disease, emphysema, and may complicate pregnancy," yet cigarette advertisements feature young, handsome football players, skiers, gymnasts, and cowboys puffing away. Tobacco companies sponsor golf, tennis, auto racing, and other sporting events, and their advertisements are seen as the camera pans the area. While the American Public Health Association and the American Medical Association try to ban tobacco advertising and persuade the media not to accept advertisements, more than forty magazines such as *Science Digest, Sports Illustrated, Cosmopolitan* and *Field & Stream* continue to accept tobacco advertisements.[12] These forums are used to link the image of smoking to sports, beauty, and modern lifestyles. Physicians might think twice before placing these periodicals in their waiting rooms.

Madison Avenue's gold — the selling of sex and youth — has turned into straw or worse for the health of too many Americans.[13] Physicians now worry that weight-conscious parents are withholding necessary high-energy foods from infants in the hope of preventing weight problems in their child's adulthood.[14] Thin celebrities in bathing suits extol the benefits of diet soft drinks on television, providing unrealistic body images for adolescents. Under the constant barrage of the goal of thinness, adolescents respond to their inability to achieve this goal with guilt or, even worse, with anorexia and/or bulimia. These eating disorders are paralleled by a less well-known obsession for exercise prevalent among swimming, running, and aerobic addicts. The most obsessed will combine binging and purging, too much exercise, and laxatives. Steven Levenkron describes these obsessions with thinness as "pathological exaggerations of society's message to women."[15]

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12. Kenneth E. Warner, *Selling Smoke: Cigarette Advertising and Public Health* (Washington, DC: American Public Health Association, 1986).

13. T. Monahan, "Fitness and exercise in advertising: mining a national mania," *The Physician and Sports Medicine,* 1987, *15*(5):160–168.

14. G. S. Golden, "A hard look at fad therapies for developmental disorders," *Contemporary Pediatrics,* 1987, pp. 47-60.

15. S. Levenkron, *Treating and Overcoming Anorexia Nervosa* (New York: Charles Scribner's Sons, 1982).

We have allowed Madison Avenue to sell us on thinness, not normal body structure, as the key to health, beauty, and success. In doing so, the ad-men have set a goal for Americans that most can never achieve. At the same time, they have created a never-ending market for selling useless and sometimes harmful products to the uninformed and gullible.

Attack on Medical Care

Calls for the medical care system to shift its priorities to prevention are loud and getting louder. One reason is cost. In 1929, health absorbed 3.5 percent of the gross national product — less than $5 billion; in 1986 about ten percent — almost $250 billion.[16] Another reason is the public perception that continued gains in wellness are not being achieved at a rapid enough rate. Indeed, progress has been painfully slow in curing cancer and the common cold and fulfilling the promises of political and medical spokespersons.

The medical profession has taken a beating from widely publicized articles, such as the *New England Journal of Medicine* report that the frequency of surgery varies much more with the presence of surgeons than it does with patient need.[17] At the extreme, Ivan Illich has argued that physicians often do more harm than good.[18] Medical practitioners have heard this argument before. It is used by some to avoid seeking appropriate medical attention. Alternative care providers, such as homeopaths and nutritionists, promise cures and wellness without medical treatment or surgical procedures, and may cost some who truly require medical attention their lives.

Although critics might argue otherwise, mainstream medicine is and has always been heavily involved in prevention. Pediatricians administering immunizations, internists screening for cholesterol and obstetricians who counsel against exposure to Kitty Litter and dispense prenatal vitamins are all practicing preventive medicine. In fact, when the National Heart, Lung, and Blood Institute's Working Group on Heart Disease Epidemiology met in 1979 to analyze the

16. National Center for Health Statistics, *Health–United States 1981*.

17. J. P. Bunker and J. E. Wennberg, "Operation rates, mortality statistics and the quality of life," *New England Journal of Medicine*, 1983, *289*:1249–1251.; C. E. Lewis, "Variations in the incidence of surgery," *New England Journal of Medicine*, 1969, *291*:880–884.

18. I. Illich, *Medical Nemesis: The Expropriation of Health* (New York: Random House, 1975).

causes of the decline in coronary heart disease between the mid-1960s and late-1970s, it could not split the decline between prevention and medical care; they were too intertwined.[19] When a fifty-year-old man experiencing dizzy spells goes to a physician who finds high blood pressure and then recommends a new diet, moderate exercise, stress management, and medication, is it prevention or medical care? Obviously the answer is both.

Being Solely Responsible for One's Health

Physicians recognize that not everyone in America has the willpower to control a long-standing smoking habit, change the eating habits of a lifetime, and exercise if it is boring or hurts. In a society that is rapidly adopting survival of the fit as the moral spine of its health policy, however, those who do not join the wellness movement and subsequently become ill may often be considered heretics who deserve no help because they had their chance to be healthy and failed. Isolated poor, minorities, and other disadvantaged people will top the list of heretics (along with morally despised groups such as homosexuals, prostitutes, and drug addicts). These groups already have the highest death and morbidity rates. The Department of Health and Human Services' recent *Health Status of the Disadvantaged: Chartbook 1986* and *Report of the Secretary's Task Force on Black and Minority Health* show the death rate of the adult poor, uneducated, and Black and Native American minorities to be about fifty percent higher than the national one. Excess death is concentrated in diseases like perinatal mortality, cirrhosis, diabetes, and cancer — much of which could be prevented.[20]

The propensity of disadvantaged populations to have unhealthy behaviors appears at early ages. For example, Center for Disease Control data for 1981–1983 for the population eighteen to thirty-four years old shows behavioral risks among people with less than a ninth grade education to differ significantly from those with some college education. Those who had the least education were twice as likely to smoke, eighty percent more likely to have high

19. National Heart, Lung and Blood Institute, *Working Group on Heart Disease Epidemiology, Report (NIH 79-1667)* (Washington, DC: U.S. Department of Health, Education and Welfare, 1979).

20. *Health Status of the Disadvantaged: Chartbook 1986*, DHHS (HRSA) HRS-P-DV86-2, 1986; DHHS, *Report of the Secretary's Task Force on Black and Minority Health, Vol. 1: Executive Summary, 1985* (USGPO 0-174-719, 1987).

blood pressure, seventy-eight percent more likely to be obese, and thirty-seven percent more likely not to use seat belts.[21] These differences clearly have serious health implications. Wellness programs insisting that jogging three miles three times a week and eating low cholesterol foods will make you healthier may be embraced by the upper-middle class executive, but they will not substantially help the poor, homeless, debilitated, or those on welfare.

The deep gaps in health and health behaviors are increased for the isolated and disadvantaged who do not always have access to wellness, especially those living in economically depressed regions. For example, five populous urban and industrial Northern states (e.g., New York, New Jersey, Illinois, Connecticut, and Massachusetts) had the highest cancer death rate among white males in the United States in 1939. Arkansas, North Carolina, Tennessee, West Virginia, and Kentucky had the lowest rates — half that of the Northern five. Gradually the gap between these states narrowed and, by 1981, the cancer death rate was actually higher in the five Southern states.[22]

Changing lifestyles, relocation and cleaning-up of industry, population migration, and better diagnosis and recordkeeping help explain the changing pattern of cancer mortality between 1939 and 1981. The result, however, is a mismatch between today's need for state cancer prevention programs and their actual distribution. George Washington University's National Health Policy Project analyzed the geography of state cancer prevention programs. A state could have up to nine different programs. The five urban Northern states averaged six, the five more rural Southern states only two. These five Southern states will find it hard to develop such programs, as they are among the poorest and most conservative in the United States.[23]

Disadvantaged people living in isolated communities in poor states badly need cancer prevention and early detection programs, and they are the least likely to get them from either their states or

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21. Michael R. Greenberg, "Urban/rural differences in behavioral risk factors for chronic diseases," *Urban Geography*, 1987, *8*:146–151.

22. Michael R. Greenberg, "The changing geography of major causes of death among middle-age white americans, 1939–1981," *Socio-Economic Planning Sciences*, 1987, *21*:223–228.

23. National Health Policy Project of George Washington University, *State Legislated Actions Affecting Cancer Prevention: A Fifty State Profile* (Springfield, Va: NTIS, 1984).

local businesses. Without targeted federal cancer prevention programs accompanied by programs addressing poverty, education, and mistrust of physicians and medical care institutions, the disadvantaged are not only going to fall further behind in health, but they will also be blamed for their own failure to achieve wellness.

The Role of Health Care Professionals in Making Wellness Healthier

There are a number of ways to improve the present policy of wellness. In order for laymen to understand health-related risks, physicians, scientists, and journalists need to express newly determined risk factors in common terms — by comparing them to familiar ones like cigarette smoking or motor vehicle accidents. Merely mentioning risk frightens some people, but others will be able to better understand the relevance of the latest carcinogen if they know that it is estimated as the equivalent of smoking three cigarettes daily, or of living within two miles of a nuclear power plant for fifty years. The current shotgun approach to prevention, calling for the avoidance of all possible hazards based on the premature release of research data, trivializes the most important public health messages, ones that truly save people's lives such as seat belt use and not drinking and driving. Premature attempts at promoting wellness look foolish when yesterday's deadly hazard turns out to be less hazardous than its replacement in the marketplace, when a wonder drug turns out to be no better than a placebo or, worse, is found to be a health hazard in and of itself. To avoid this pitfall, physicians and health care scientists need to be circumspect with their calls for changing behavior. Crying wolf too often results in public cynicism and the danger of denial of true risk.

The responsibility for dispensing accurate information on wellness lies not only with the media, but especially with the medical care community. As we have stated, prevention, or health maintenance, is fully integrated into medical care, not opposed to it. Not only are health care professionals important for protection from, screening for, and curing of diseases, they should additionally be involved in the active promotion of wellness. To achieve this goal it is necessary for medicine to change its image, to learn strategies that tie medical care to health and well-being in the mind of the individual, rather than exclusively to the curing of disease. The beginnings of this approach are now under way, with a growing

emphasis on preventive medicine in medical school curriculums and new marketing approaches to routine health maintenance visits. These strategies hold promise for both physicians and the public. The medical community needs to control the wellness phenomenon. If it does not take the reins, the gold-diggers will control it.

Public health theory demands that the national focus of wellness should be on reducing those risk factors that will help the greatest numbers of people and are supported by the overwhelming majority of scientific evidence. Government and the medical community need to de-mystify exercise and nutrition by admitting how little is known about them. We need to demand proof that aerobics, treadmills, rowing machines, workout videos, special diets, vitamin therapies, and fiber pills are better than a brisk walk and eating moderately. Efforts in this regard will save countless millions of dollars from being spent on worthless and even dangerous self-treatments that may draw persons away from mainstream medical screening and care.

Finally, policy-makers need to recognize that health promotion does not automatically lead to better health. Government needs to address the geographic and demographic maldistribution of wellness opportunities if we are to make progress towards the goals stated by the Surgeon General for the year 2000. Prevention should not be used as an excuse for cutting health budgets, or neglecting genetic, social, cultural, and other long-standing environmental causes of disease beyond the control of the individual. Not all persons have access to wellness in the form of accurate information, screening, and health maintenance opportunities. And not all of those who do have access to these benefits will accept the policy of wellness for themselves or for their families, either out of fear, mistrust or misunderstanding.

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Review

CHARLES E. ROSENBERG. *The Care of Strangers: The Rise of America's Hospital System*. 437 pp. New York: Basic Books, 1987. Price $22.95

Reviewed by STEVEN J. PEITZMAN

By the time this review appears, Professor Rosenberg's *The Care of Strangers* has been available for well over one year. This is a book of lasting merit, so the timing of its review is not crucial. And it is particularly suitable that a review appears in the publication of the College of Physicians of Philadelphia. Charles Rosenberg, probably America's leading historian of medicine and one of Philadelphia's most widely known scholars is a Fellow of the College and has been a faithful and generous advisor and friend to its Library and to the Wood Institute. The historical collections of that Library, particularly its superb nineteenth-century holdings, have in turn supported the research of Professor Rosenberg and his many students.

The Care of Strangers is an account of the American hospital from its largely eleemosynary roots in the eighteenth and nineteenth centuries, when it served social more than medical purposes; to its early twentieth-century form. By then, its transformation to a bureaucratic and highly technological institution was already well underway. Until the twentieth century, the hospital cared mainly for the poor and the marginal. But its medical staff and lay leadership belonged to the middle and upper classes, so the early American hospital became a microcosm of a society shaped by class distinctions. Gradually the setting of treatment for acute illness shifted from home to hospital, even for the middle class and affluent. Competition among hospitals for paying patients is not new; the phenomenon can be demonstrated eighty years ago. Instrumental in bringing the middle class into the hospital was the ascent of surgery, a product of asepsis, cumulating technical knowledge, and, it would seem, the discovery of appendicitis. More generally, the acceptance of scientific medicine, and increasing reliance on the laboratory, favored the hospital as the center of medical care. Complaints about objectification and dehumanization of the patient (though not in

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these words) were voiced early in the century, for example, by Bostonian physician Richard C. Cabot in 1909. But the attitude Cabot condemned was not only a manifestation of increasing technology in a more complex hospital: regimentation always had been demanded, and patients in nineteenth-century British, and American, hospitals were typically addressed by their bed number — "How are you today, number twenty?." The hospital has imposed varying but powerful social controls as it has changed and grown.

Rosenberg's book reviews a variety of historical processes which influenced the evolution of the hospital. In addition to those already mentioned were the establishment of nursing as a profession, the reformation of American medical education, and the evolution of specialization. Each of these processes was inseparable from the evolution of the hospital. One might suggest that if the hospital was a microcosm of society, it became almost the macrocosm of medicine.

What methods and sources will the reader encounter in *The Care of Strangers*? Charles Rosenberg has been a leading innovator in the social history of medicine, yet he still remains, I would say, a traditional modern historian. By "modern" history I refer first to the goal of capturing the thought of earlier persons and peoples, not just recounting their actions; and second, to the use of primary, often archival, sources. Professor Rosenberg is "traditional" in choosing to rely on the written or published word, in preference to quantification. His words are clear and accessible: the reader encounters neither sociological jargon nor the heady neologisms so popular with many current interpreters of science and medicine. The sources are remarkably varied: well-known and obscure medical and nursing journals; annual reports of hospitals large and small; letters, such as those of a woman contemplating her first hospitalization in the 1890s, or from a Johns Hopkins Hospital student nurse in the same period. Rosenberg remarks that he spent "more years than I like to recall" on this book, but only years of searching and luck could result in such sources. It is not easy to indicate in a review just how Rosenberg uses his sources: he provides frequent brief quotations, selecting phrases which are compelling in their context, pointedly persuasive for his arguments, often strikingly evocative of a social or scientific world view.

Little is missing from *The Care of Strangers* which, as many reviewers already have pointed out, really amounts to a social history of American medicine, though the term "social history" is far

too narrow. I would have liked to learn more about what was actually *done* for non-surgical patients in the early twentieth century — what was the texture of their daily treatment. Diet, rest, and electrotherapy are mentioned briefly. I also came away unsatisfied concerning the factors, other than need for operation, which induced well-to-do Americans to enter a hospital when ill — to change fundamentally their identification of the appropriate setting in which one assumes the sick role. Professor Rosenberg himself in one passage admits the reasons are "obscure," but elsewhere assumes that such patients were persuaded to accept the hospital by their physicians. Obviously few patients would have left written traces to help the historian fully answer this question.

The scope of this book is 1800 to 1920. In a final chapter, "Past in Present," however, Professor Rosenberg summarizes his historical themes and briefly relates them to the present. Rosenberg calls the current hospital a "product and prisoner of its own history." Any reader who works or teaches in a hospital can amplify this statement. Indeed now the hospital is also a victim of its own success, or of the too-successful fulfillment of its twentieth-century vision. As palace of surgery and medical technology, its expense is seen now as intolerable. External monitors — government and insurers — demand that physicians return the patient to care at home, a demand still reluctantly accommodated. New operations and procedures replace those lately assigned to outpatient status; new diseases such as AIDS fill beds emptied by old diseases rarely seen; and still the old social function persists, as hospitals yet take in the homeless, the alcoholic, the old, the withered. You can't go home again — not entirely.

I began by stating that *The Care of Strangers* will be a book of lasting merit. My copy has proved, however, not very durable. Though always in the care of its owner, the volume became unglued in the middle of the photograph section (not, I hope, a portent of the hospital's future). It is not very common these days for reviewers to comment on the material strength of new books, but I would suggest that a respected publisher such as Basic Books might return to the basics of binding. Nonetheless, Fellows and other readers of the *Transactions & Studies of the College of Physicians of Philadelphia* who have not procured a copy of *The Care of Strangers* should do so. They will be rewarded by reading this rich account of the

evolution of modern medicine within American society, and of medicine's dominant and problematic theatre, the hospital.

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Review

SUSAN SONTAG. *AIDS and Its Metaphors.* 95 pp. New York: Farrar, Straus and Giroux, 1989. Price $14.95

Reviewed by NANCY TOMES

Reading Susan Sontag's essay *AIDS and Its Metaphors* is like spending an afternoon with an imaginative, well-read, but opinionated friend: the conversation leaves one simultaneously dazzled, confused, and exhausted. Ranging broadly over history and literature, Sontag has strung together a series of insightful but loosely-connected observations about what, in more academic circles, is referred to as the "social construction of disease." While her musings are always interesting and thought-provoking, Sontag has mastered too little of the history of medicine to provide a compelling case for her generalizations about the cultural meanings assigned to disease in general, and AIDS in particular.

Sontag's discourse on AIDS picks up where her influential essay *Illness As Metaphor* (1978) left off ten years ago. As she explains in her new book, her critical assault on the metaphorical uses of disease drew upon Sontag's own experiences as a cancer "victim." She writes,

> My purpose was, above all, practical. For it was my doleful observation, repeated again and again, that the metaphoric trappings that deform the experience of having cancer have very real consequences: they inhibit people from seeking treatment early enough, or from making a greater effort to get competent treatment. The metaphors and myths, I was convinced, "kill" (p. 14).

The new essay returns to these same general themes, extending her comparisons between cancer and tuberculosis to include AIDS, the new "plague" of the 1980s.

Sontag's polemic against the metaphorical uses of disease focuses on two essential points: their role in assigning individual blame for illness, and their use in invoking larger social evils. In the late twentieth century, cancer used to be the dominant source of metaphors, but "[i]n recent years some of the onus of cancer has been lifted by the emergence of a disease whose charge of stigmatization, whose capacity to create spoiled identity, is far greater,"

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namely AIDS (p. 16). The cancer/AIDS comparison forms the intellectual backbone of the piece. In Sontag's view, the critical points of metaphorical difference between the two diseases reflect the greater degree of scientific knowledge about the etiology of AIDS. After decades of research, the underlying causes of cancer still remain mysterious, while AIDS has been securely linked to a virus transmitted by a limited range of "high-risk" behaviors.

The infectious nature of AIDS places it within the cultural domain of age-old conceptions of epidemic disease. Like the bubonic plague and cholera epidemics of old, AIDS is represented as an infection originating outside the society, which comes as a punishment for individual and societal decadence. Much of what Sontag has to say about the moralistic response to AIDS is predictable. Her political reading of the epidemic is more idiosyncratic. Sontag plays up the racist and neocolonial prejudices evident in the Western belief that AIDS originated in Africa. She notes that many Africans believe that the CIA developed the virus and sent it to Africa, where it was contracted by homosexual American missionaries who imported it back to the United States. While frequently referring to the special stigma attached to AIDS as a sexually-transmitted disease, Sontag plays down the issue of homophobia, characterizing AIDS more as a disease of promiscuous, rather than of "deviant," sexual practices.

The more interesting parts of Sontag's commentary concern the imagery of AIDS as a viral disease. At the same time AIDS evokes traditional images of plague, she observes, it also calls forth new conceptions of "space-age" disease. "In the era of Star Wars and Space Invaders, AIDS has proved an ideally comprehensible illness . . ." The viral invader "docks" with the cell and "takes up permanent residence, by a form of alien takeover familiar in science-fiction" (p. 18). Compared to bacteria, viruses are more primitive in form yet far more sophisticated in their activities. "Viruses are not simply agents of infection, contamination. They transport genetic 'information,' they transform cells" (p. 68). Perhaps more importantly, some viruses apparently evolve and can mutate into ever more deadly strains. In short, viruses are the ultimate in "smart germs;" they are portrayed as "a menace in waiting, as mutable, as furtive, as biologically innovative — reinfor[cing] the sense that a disease can be something ingenious, unpredictable, novel" (p. 70).

Sontag's understanding of the links between disease and culture appears remarkably simplistic at times. For a writer whose name is

so often linked with the "social construction of disease," she has a surprisingly conventional view of medicine. Having herself been "cured" by modern, high-tech measures, she exhibits little patience with preventive medicine or psychosomatic explanations of illness and treatment. For example, she writes dismissively of the early twentieth century emphasis on good food, rest, and fresh air in the crusade against tuberculosis. "What conquers — that is, cures — tuberculosis is antibiotics, which were not discovered until . . . the 1940s" (p. 10). Yet, as any student of tuberculosis knows, susceptibility to the disease is closely tied to levels of nutrition and general health; and such preventive measures were not nearly so misguided as Sontag suggests.

Sontag is also critical of efforts to classify the stages of AIDS infection in order to monitor the disease's spread, on the grounds that labels such as HIV-positive, and AIDS Related Complex (ARC) encourage discrimination and increase fatalism about the disease. When, however, the only reliable defense against losing more lives is prevention, and prevention depends upon identifying those who may carry the virus, Sontag's concern about the negative impact of classification on the patient must be balanced against the urgent goal of slowing the spread of the disease.

Sontag concludes by portraying AIDS as an apocalyptic disease that is gradually coming to "seem part of the ordinary horizon of expectation." Along with nuclear war, world famine, and the greenhouse effect, the "normalization" of AIDS gives testimony to the "unparalleled violence that is being done to our sense of reality, to our humanity." In spite of this frightening prospect, Sontag hopes that the process of learning to live with AIDS will strip it of its dangerous metaphors, particularly what she terms the "medical model of the public weal," and the military imagery of health and disease.

Using disease as a synonym for social problems, Sontag warns, has traditionally been "not only a persuasive justification for authoritarian rule but implicitly suggests the necessity of state-sponsored repression and violence (the equivalent of surgical removal or chemical control of the offending or 'unhealthy' parts of the body politic)" (p. 94). As yet in the AIDS epidemic, this kind of argument has been used primarily by those conservatives who see AIDS as God's retribution against sinners in modern society. Sontag recalls, however, the Nazis' use of cancer imagery to describe European Jews, and lets the reader draw the obvious conclusions.

The destructive influence of the military imagery of a "war" against disease is more subtle, but very dangerous as well. Sontag complains that "it overmobilizes, it overdescribes, and it powerfully contributes to the excommunicating and stigmatizing of the ill" (p. 94). She insists, "We are not being invaded. The body is not a battlefield. The ill are neither unavoidable casualties nor the enemy" (p. 95).

Yet Sontag's dream of creating a culture where illness can be confronted without metaphor of some sort is very hard to imagine. Without denying the terrible pain inflicted by the negative cultural baggage some diseases acquire, one wonders if the human race can do without some system of explanation, some scheme for making sense of illness other than the rational resort to modern medicine that Sontag apparently favors. When that rational strategy fails, the tendency to interpose metaphors between ourselves and death is powerfully strong.

Moreover, those systems of imagery need not always be destructive. At the level of debate about the "public weal," disease metaphors have been used constructively to alert the comfortable classes to the suffering of the less fortunate. For example, during the Progressive period, the concept of the "socialism of the microbe" was successfully used to break down Social Darwinist neglect of the poor and their health problems. Likewise, at the level of the individual patient, metaphors can comfort as well as wound, engage the psyche in the effort to heal the soma, and rally the patient's will to survive.

In her well-justified indignation over the stigmatization of the ill, Sontag may be unjustly blaming the metaphors for the fear of disease and death that gives them their destructive force. The root of the problem lies not so much in the language as in the bankruptcy of social and emotional resources that we as a culture bring to the contemplation of our own demise. Sontag has done us all a service by raising our consciousness about the potentially destructive force of certain disease metaphors; but in condemning their use, she confuses the bearer with the bad news.

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New Books In the History of Medicine in the Historical Collections of the Library, April Through June 1989

JACK ECKERT

Louis Bakay, *Neurosurgeons of the Past* (Charles C. Thomas Publisher, 1987).

Walter E. Barton, *The History and Influence of the American Psychiatric Association* (American Psychiatric Press, Inc., 1987).

Joan Jacobs Brumberg, *Fasting Girls: the Emergence of Anorexia Nervosa as a Modern Disease* (Harvard University Press, 1988).

Center for Hospital and Healthcare Administration History, *United States Hospital Histories* (American Hospital Association, 1989).

William A. Cole, *Chemical Literature 1700–1860: a Bibliography with Annotations, Detailed Descriptions, Comparisons and Locations* (Mansell Publishing Limited, 1988).

Sander L. Gilman, *Disease and Representation: Images of Illness from Madness to AIDS* (Cornell University Press, 1988).

Judith Moore, *A Zeal for Responsibility: the Struggle for Professional Nursing in Victorian England, 1868–1883* (University of Georgia Press, 1988).

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Memoir of Carl F. Schmidt, 1893–1988

GEORGE B. KOELLE

Carl Frederic Schmidt was born on 29 July 1893, the son of Jacob Charles and Mary Ellen (Greth) Schmidt, in Lebanon, Pennsylvania. A little over a dozen years earlier Rudolph Bucheim, who had established the world's first pharmacological laboratory, died in Dorpat, Estonia. His student, Oswald Schmiedeberg, who is generally regarded as the Father of Pharmacology, remained alive and active until 1921. Thus, Dr. Schmidt's life began at approximately the same time as the inception of the science of pharmacology.

Following his graduation from Lebanon High School and Lebanon Valley College, Dr. Schmidt attended the Medical School of the University of Pennsylvania and graduated in 1918. After an internship at the Hospital of the University of Pennsylvania during the influenza pandemic, he joined the Department of Pharmacology under Dr. Alfred Newton Richards. He also married his college sweetheart, Elizabeth Viola Gruber. They had two children, Carl Frederic, Jr., and Barbara Elizabeth, and celebrated their sixtieth wedding anniversary shortly before Mrs. Schmidt's death in 1982.

Three years after joining the University of Pennsylvania, Dr. Schmidt accepted an invitation from the China Medical Board of the Rockefeller Foundation to spend two years organizing the Department of Pharmacology of the Peking Union Medical College. Following his return from China in 1924, he took up his duties as Assistant Professor of Pharmacology at Penn; he was promoted to Associate Professor in 1929, and to full Professor in 1931. Dr. Schmidt became Chairman of the Department in 1939 and occupied that post until his retirement in 1959. He then served as research director of the United States Naval Air Development Center at Johnsville, Pennsylvania, until his ultimate retirement in 1969. After he and Mrs. Schmidt had moved temporarily to St. Petersburg, Florida, he became Clinical Professor of Pharmacology at the University of South Florida from 1970 until their return to Philadelphia twelve years later, when Dr. Schmidt was in his late eighties.

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In spite of his numerous other activities related below, Dr. Schmidt always considered his primary responsibility to be teaching. His lectures were models of clarity, precision, and enthusiasm, and inspired his younger colleagues to follow suit. As a result, pharmacology was generally acknowledged by the students to be the best course in the medical school.

Research

Early in his career, Dr. Schmidt was involved in a study that rapidly brought him worldwide fame. While in Peking, he and his associate, K. K. Chen, conducted a survey of what appeared to be the most promising of the four thousand botanicals of the Chinese pharmacopeia in the hope of finding some with useful activity. After they had amassed a great number of negative results, Chen's uncle, a Chinese pharmacist, suggested that they test *ma huang*, a substance from a native tree. They were amazed to find that its aqueous extract produced a prolonged rise in a dog's blood pressure (all other botanicals were either negative or hypotensive). From *ma huang* they isolated the active alkaloid, ephedrine, which became the prototype of a great number of synthetic sympathomimetic amines that are still widely employed in therapeutics.

After his return to Pennsylvania, Dr. Schmidt became involved in renal studies, partially in collaboration with his chief, A. N. Richards. He then moved into respiratory and cardiovascular pharmacology, in which he made his outstanding contributions. They included precise analyses of the influences of reflexes, particularly from the carotid body and sinus, on the respiration and circulation, and their modification by drugs. He initiated pioneering studies on the measurement of the cerebral circulation, leading eventually to the standard method now employed clinically, which he developed in collaboration with Seymour Kety. With the advent of World War II, Dr. Schmidt became deeply involved in aviation medicine. Here his aim was the development of means for improving the performance of pilots under extremes of gravitational and anoxic stresses. He returned to the same area many years later at another level, after he became Research Director of the Naval Air Development Center, which contained the world's largest human centrifuge. He worked closely with John Glenn, Frank Borman, and the other pioneer astronauts in showing them how to deal with the tremendous G-forces they would encounter.

Role in National and International Pharmacology and Medical Sciences

The list of Dr. Schmidt's societies and offices, editorships, committees lectureships, and honors is a long one. Pharmacology on the international scene began as the Section on Pharmacology (SEPHAR) of the International Union of Physiological Sciences (IUPS), which in turn belonged to the International Council of Scientific Unions (ICSU). (At the annual meetings of the American Pharmacological Society, Dr. Schmidt used to delight us all with accounts of the activities of these acronymical associations.) Among all the pharmacologists of the world, Dr. Schmidt was elected the first president of SEPHAR, in 1959. When pharmacology achieved independent status in 1965 as IUPHAR — the reader can work out that one — Dr. Schmidt, by then retired, was elected its Honorary President.

Dr. Schmidt belonged to the American Society for Pharmacology and Experimental Therapeutics (Vice President, 1940–1942, President 1948–1950). He was also a member of the National Academy of Sciences; the American Academy of Arts and Sciences; the American Heart Association; the American Physiological Society; the Society for Experimental Biology and Medicine; the Association of American Physicians; the American Association for the Advancement of Science; the Physiological Society of Philadelphia; the Penn Valley Association (President 1944–1946); the Medical Association of the Argentine; the Merion Cricket Club; and others. Dr. Schmidt was Managing Editor of the *Journal of Pharmacology and Experimental Therapeutics* (1940–1942); Managing Editor of *Circulation Research* (1958–1962); and Associate Editor of *Chemical Abstract* (1942–1948). His list of memberships on important international and national committees is extensive.

A Fellow of the College of Physicians of Philadelphia from 1973, Dr. Schmidt gave a great number of honorary lectures, including the Mary S. Newbold Lecture of the College in 1943. In 1976, his old department established the Carl F. Schmidt Honorary Lectureship. Dr. Schmidt gave the first annual lecture of the series. Subsequent lectures, which are followed by a dinner and evening of good fellowship, were presented by his former associates and by distinguished pharmacologists from throughout the world. He and Mrs. Schmidt attended all up to the times of their deaths. The Schmidt Lectures will continue in perpetuity.

Among Carl Schmidt's many honors were honorary degrees from his alma maters, Lebanon Valley College and the University of Pennsylvania, and from Charles University in Prague. In 1984, he received the Distinguished Graduate Award of the School of Medicine of the University of Pennsylvania. He was the sixth recipient of the Schmiedeberg Plakette of the German Pharmacological Society in 1962. The citation which accompanied the award captured the man: "for magnificent contributions to service for pharmacology and in recognition of his spirit of magnanimity and great humanity."

General

The designation "clinical pharmacology" refers to an extremely important, relatively young branch of the science that concerns the investigation of new drugs in human subjects after their efficacy and safety have been established by animal studies. Although I never heard either of them use the term, Dr. Schmidt and his predecessor, Dr. Richards, were among the pioneers in this field. Most of their junior associates were residents in internal medicine, anesthesiology, and other medical specialties who spent one or more years in the Department of Pharmacology learning the principles of research. They then returned to their clinical departments to put these principles into practice.

The list of Dr. Schmidt's trainees and research associates reads like a Who's Who of distinguished medical scientists. It includes, in no particular order, Julius H. Comroe, Jr., Robert D. Dripps, Jr., Seymour S. Kety, Isaac Starr, Hugh Montgomery, Orville Horwitz, Christian J. Lambersten, Marilyn E. Hess, James W. West, Paul R. Dumke, Domingo M. Aviado, Jr., James E. Eckenhoff, Werner Kalow, Aurelio Cerletti, John H. Moyer, Hadley L. Conn, Jr., Alfred E. Livingston, and Arthur M. Walker. Although I was Dr. Schmidt's first graduate student, I was never privileged to work in his laboratory. He graciously allowed me to submit some work I had completed at the Medical Research Laboratory, Edgeworth Arsenal, as a thesis.

After the death of Mrs. Schmidt, Dr. Schmidt lived with his son, Carl Jr., and his wife Betty. Shortly after Dr. Schmidt's death, at the age of ninety-four, the tragic premature death of his son followed. Betty ministered to them both, with deep affection and devoted care to the end. In addition to his daughter, Barbara Eliza-

beth de Long, Dr. Schmidt left five grandchildren and one great-grandchild.

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Memoir of R. Philip Custer, 1903–1989

PETER C. NOWELL

Philip Custer, a member of the College of Physicians for more than fifty years, died on 3 May 1989, at the age of eighty-five. In a career that spanned almost six decades, he made major contributions to the understanding of human leukemia and lymphoma, and his activities ranged from the practice of pathology and hematology to a variety of experimental studies. His *Atlas of the Blood and Bone Marrow*, first published in 1949, with a second edition in 1974, provided an invaluable tool for the practitioner, student, and clinical investigator. Less well recognized was his profound influence on scores of trainees and colleagues over the years, in their thinking about hematologic neoplasms and in their concerned and humane approach to patients.

Philip Custer was born in Munhall, Pennsylvania, on 14 July 1903. He was educated at Chestnut Hill Academy, Bucknell University, and the Jefferson Medical College, graduating from the latter in 1929. After a rotating internship at Bryn Mawr Hospital, he served two postdoctoral fellowships at the Pathologisch-Anatomisches Institüt of the University of Innsbruck, Austria, in 1930 and 1932, developing expertise in both anatomic pathology and mountain climbing.

His first professional appointment was as chief of pathology at the Philadelphia General Hospital in 1931, and he served in that capacity until 1938. During this period, Dr. Custer studied carefully the bone marrows of thousands of autopsy cases, developing the enormous base of information on human hematopoiesis that led to several definitive publications on the structure and function of bone marrow under a wide variety of conditions and also helped form his later unifying concepts.

At the same time, he became a member of the department of pathology of the University of Pennsylvania School of Medicine, rising from the rank of assistant instructor in 1929 to professor in 1958, with emeritus status in 1970. Throughout most of this period he was an active participant in the teaching programs of the department, lecturing on the leukemias and participating in the experimental pathology laboratory, which was for many years a unique feature

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of the pathology course. In 1931 he co-authored a "Handbook of Experimental Pathology."

In 1938 Dr. Custer moved to the Presbyterian Hospital in Philadelphia (later the University of Pennsylvania-Presbyterian Medical Center) as director of laboratories and subsequently as chairman of the department of pathology at that institution. In these capacities, he not only had responsibility for the anatomical and clinical pathology services but also carried on an active clinical practice in hematology. It was during this period, which lasted until his first retirement in 1968, that Dr. Custer focused particularly on difficult problems of the lymphoid system, helping to clarify diagnostic, biological, and clinical aspects of infectious mononucleosis, Hodgkin's disease, lymphogranuloma venereum, lymphomas of the gastrointestinal tract, and hypersplenism, among others. His work on hypersplenism was the basis for an article in the *Transactions & Studies of the College of Physicians of Philadelphia.*[1]

These efforts were further stimulated by his military service during World War II (1942–1946) where, rising from Captain to Lieutenant Colonel, he served as chief of the Reticuloendothelial Section at the Army, now Armed Forces, Institute of Pathology (AFIP), reviewing a vast number of difficult lymph nodes.

From his extensive studies of lymphomas, both in Philadelphia and at the AFIP, Dr. Custer developed a concept of the nature of these neoplasms that was significantly ahead of its time. He was among the first to suggest that variant histological patterns in the same patient at different locations or at different times did not necessarily represent separate tumors. Rather, he believed that these were systemic disorders that could have variable histological patterns under different circumstances. This view was unpopular in a field largely populated by "splitters," but subsequent technical and conceptual developments demonstrated the truth of this approach, and it has served to underpin many of the further developments in our understanding of these neoplasms in recent decades.

During his time at the Presbyterian Hospital, Dr. Custer served as a member of the Council of the College of Physicians and also as president of the Pathological Society of Philadelphia. This organization presented him with its William Wood Gerhard Gold Medal

1. R. Philip Custer, "The So-Called Hypersplenic Syndrome: Its Pathogenesis, Recognition and Management," *Transactions & Studies of the College of Physicians of Philadelphia,* 1958, 26(1):1.

in 1955 for his research on lymphomas and leukemia. During this period he also served as a trustee of the American Board of Pathology and president of the Philadelphia Hematological Society. Upon his retirement from the Presbyterian Hospital, in 1968, the newly renovated laboratories were renamed the R. Philip Custer Laboratories, and the R. Philip Custer Lectureship was established in his name.

He began a second career in 1969, when he joined the Institute for Cancer Research of the Fox Chase Cancer Center as a senior member in charge of pathology. In this role, during the next eighteen years, he collaborated with a large number of investigators in various studies of carcinogenesis and other aspects of normal and abnormal growth. The work involved a variety of species ranging from frogs and mice to human patients. This was a remarkably productive phase of his work, resulting in nearly half of the approximately 100 scientific papers that he authored during his lifetime. His intellectual vigor was maintained throughout this period, and it was only failing physical health that finally forced his second retirement in 1987.

This brief survey indicates the wide-ranging spectrum of contributions that Dr. Custer made to our understanding of neoplasia, particularly in the hematopoietic system. It tells little about the man himself. Philip Custer was a quiet, unassuming man, succinct both in speech and in writing. Patients, students, and colleagues knew him as a compassionate, concerned, dedicated individual who devoted countless hours to the needs of others. His reserved manner was spiced by a dry wit that was particularly adept at puncturing pomposity. Although he had limited time for his private life, Dr. Custer was a devoted husband and father. In 1939 he married Claire Lohrke and they had twin children, as well as two children from her previous marriage. Claire died in 1968, and Custer married Elizabeth Harvey in 1974. He managed throughout life to find some time to exercise an artistic talent, etching and working in watercolors, but his major devotion was always to his clinical and research activities. His written contributions in this area remain of

major importance, but perhaps an even greater impact has come through the scores of younger individuals whose lives he influenced.

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Editorial

With this issue, I begin my year-long term as editor of the *Transactions & Studies of the College of Physicians of Philadelphia*. For a historian of medicine to assume editorship of a medical journal that has been in existence for almost two hundred years is a humbling but exhilarating experience. Series V of the *Transactions & Studies* has been devoted to medicine and history, and under the capable guidance of its most recent past editors, Drs. Saul Jarcho, John McClenahan, Russell Maulitz, and Diana Long, the journal has been well-launched in this new direction. I hope in my year as editor to continue their good work: to use the pages of the *Transactions & Studies* to promote further explorations of the extensive historical resources of the College of Physicians of Philadelphia, and the broader history of medicine it so richly reflects.

In an address to our sister institution in New York, Arnold Relman, the distinguished Editor-In-Chief of the *New England Journal of Medicine*, spoke recently of the pressing need for general journals of medicine. One might wonder, he began, if in our age of intensive specialization, the general journal had outlived its usefulness. But Relman argues eloquently that it is precisely the growing complexity of medicine that makes journals such as the *New England Journal of Medicine* essential to the professional education of physicians. General journals should not only keep readers informed about the latest developments in medicine, but also "make physicians aware of medicine's history and traditions and its changing role in society . . . The general journal is a window through which the physician can view his profession in a wider context." He concludes with a challenge to the editors of such journals: "To select a varied menu of the highest quality, interest, and originality that will appeal to physicians of all kinds and will help to keep the profession aware of its identity, its traditions, and its social obligations."[1]

Relman's challenge provides a useful blueprint, not just for scientific journals, but also for general journals of medicine and history such as the *Transactions & Studies*. Today, the history of medicine has become a very large and diverse field, serving a number of constituencies: clinician-practitioners; health care policy ana-

1. Arnold S. Relman, "Anniversary Discourse: the Purposes and Prospects of the General Medical Journal," *Bulletin of the New York Academy of Medicine*, 1988, 64:878, 880.

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lysts; historians in medical and nursing schools, history of medicine programs, and history departments. Over the last two decades, the specter of specialization has threatened to throw up barriers among these groups, and to diminish their ability to communicate with their broader constituencies in medicine, nursing, and other health care professions. But through the labors of groups such as the American Association for the History of Medicine and historical institutes such as the Johns Hopkins Institute and our own Wood Institute, that threat has largely been averted. Perhaps more than any disciplinary history, the history of medicine routinely engages professional historians and current practitioners in lively dialogues about the past and the future of medicine and health care in general.

As a journal serving one of the oldest and most distinguished medical societies in the United States, the *Transactions & Studies of the College of Physicians of Philadelphia* has a special opportunity and responsibility to promote historical dialogues that help put the future in the context of the past. Ours is a task of *interpretation*, of looking for the long view, of emphasizing the forest rather than the trees. To that end, I will try as editor of the *Transactions & Studies* to serve up a "varied menu," in Relman's words, of the best work in the history of the health sciences and health care institutions.

The contributors in this issue of the *Transactions & Studies* represent a variety of perspectives on medical history. Three come from humanities backgrounds: Judith Walzer Leavitt holds a Ph.D. in history, Barbara Traister holds a Ph.D. in English, and Thomas Horrocks is a doctoral candidate in history. The other four contributors, Lawrence Berk, Sol Sherry, Fred Rogers, and John McClenahan, are M.D.'s. (Two are also Fellows of the College.)

The scope of the articles, which run from sixteenth-century England to late twentieth-century America, also illustrate the breadth and vigor of medical history. The Traister and Leavitt pieces highlight how the definition and boundaries of medical practice have changed over time. Traister's work on Simon Forman, which was originally presented as a Wood Institute Seminar while she was a Rockefeller Fellow here in 1987, illustrates that astrology was once a respected aspect of medical care. Leavitt's paper on changing patterns of childbirth, which was presented as the Kate Hurd Mead Lecture at the College in 1989, suggests how and why the responsibility for childbirth shifted from women healers to male physicians. The Berk and Sherry articles address a different but equally intri-

guing problem: why two significant medical innovations — the development of an early polio vaccine in the 1930s and of thrombolytic therapy in the late 1950s — were not well received in their day. These historical narratives point to the internal and external influences on medicine that condition the acceptance and diffusion of new scientific insights.

Finally, the article by Rogers and Horrocks celebrates an unsung hero of medical history, namely the book collector. The contributions of individuals such as Dr. John Stockton Hough have built the Library of the College of Physicians of Philadelphia into one of the best medical history collections in this country. Their modern counterparts, as well as the professional archivists, librarians, and museum curators who preserve these treasures, are essential partners in the task of interpretation we have set ourselves.

With this issue, we also inaugurate a Correspondence Section, in the hope that more of our readers will respond to what they read here, and share their own experiences in the realm of medical history. We look forward to hearing from you.

Correspondence

[The following letter was received by Dr. Emily Mudd, in response to her article, "Acceptance of the Seventh Annual Award of the American Civil Liberties Foundation of Pennsylvania," which appeared in the June, 1989, number of *Transactions & Studies of the College of Physicians of Philadelphia*. Dr. Tompkins has been a Fellow of the College of Physicians of Philadelphia since 1941.]

Dear Doctor Mudd:

How very pleasant it is to be reminded of people one knew 50 years ago, you, Dr. Stewart Mudd, Dr. Abraham Stone and others. Of my contemporaries, I now only communicate with Jon Rhoads. You cannot remember me for I was only one in an audience when you were speaking. But I enclose a published piece to tell you that some of your students achieved satisfaction and rendered service in a long life. [An interview with Dr. Tompkins appeared in *Fertility News*, 1989, *23*:7–8.]

Constantly I am amazed that people find apt quotations in writing done hundreds of years ago, for instance your Fra Giovanni of 1531 (page 166 of the June *Transactions*). I'll match it with one from La Motte in 1684 or there abouts. [*A General Treatise of Midwifry* . . . , Thomas Tomkyns, trans., (London: James Waugh, 1686)]:

> To treat this matter properly after so many great men that have displayed their learning about it, not being able to advance anything new, I should be able to determine which of the three following causes carry the greatest face of probability: that is, whether it is the mere act of the *uterus,* in which are received the seeds of the man and woman, or the egg made *prolific* by the seed of the man unravelled in the womb; or at last, whether it be one of the worms of which the *semen* of the man is imagined by some to be composed; which *semen* being received in the womb, and creeping upon the surface of that ripe egg, which is come down from the *ovary,* the worm wonderfully finds out the entrance of that egg, and having lain himself snug in it, hinders any other worm from coming in, by the means of the *valve* which is placed at the very opening, which he closes up with his tail with a surprising sagacity.
>
> These things being mere hypotheses, which though never so likely at first, only hold for a time, making way for something new, which will also have its period, I will leave them to be discussed by the illustrious members of the *Academy of Sciences,* whose penetrating genius and deep learning are alone able to resolve these questions.

Finally, in your line and mine, is a startling series of articles by Paul Brodeur in *The New Yorker,* June 12, 19, and 26, 1989, on the biologic effects of heretofore disregarded electric currents. He has written a book in three parts. The part which concerns you and me most is the June

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26th part, which deals with studies of the effects of VDTs (Video Display Terminals) on pregnant women — miscarriages, malformations, premature labor, etc. It is frightening, it's new, it's unknown to all my medical and oncological friends and, worst of all, it is knowledge which seems to have been suppressed from publication for a decade.

About 1978 Nancy Wertheimer plotted on a map of greater Denver the location of the homes of children who had leukemia. She found that the pattern followed power lines, and when she revisited the homes she found transformers on nearby power-line poles. Her work was confirmed by another study. Supportive work was done in Spain (animal experimentation), Sweden, and Finland. Today in the United States we read of communities preventing power-lines being strung over them, of schools whose playyards near power-lines are forbidden to children, and so forth. But to an obstetrician the miscarriages (20 to 40 percent of exposed pregnant women) are ominous because preventable.

I was so happy to read about you and to know that you are, as we say approvingly in the South, sassy.

Very truly yours,

Pendleton Tompkins, M.D.
September 1989

[The following letter was received in response to the article, "Anesthetist and Anesthesiologist: Technology in the Social Context of a Medical and Nursing Specialty," which appeared in the June, 1989, number of *Transactions & Studies of the College of Physicians of Philadelphia*. Dr. Sommer has been a Fellow of the College of Physicians of Philadelphia since 1944.]

Dear Editor:

It was with considerable interest that I read the paper of Audrey B. Davis entitled "Anesthetist and Anesthesiologist: Technology in the Social Context of a Medical and Nursing Specialty," which was published in the June, 1989, issue of *Transactions & Studies*. There are two items in the history of American anesthesiology which merit attention.

Ether was first used as an anesthetic agent on 30 March 1842 by Crawford Williamson Long, M.D., of Jefferson, Jackson County, Georgia. Without repeating the details of the long lasting controversy regarding the priority of Long and others to whom credit should be given as the first to use ether as an anesthetic agent, I suggest that the papers of Long, Young, Packard, and DaCosta be consulted.[1] There is no question as to the impor-

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1. Crawford W. Long, "An Account of the First Use of Sulfuric Ether by Inhalation as an Anesthetic in Surgical Operations," *Southern Med. and Surg. Jour.*, 1849, 5(12):706–712; Hugh H. Young, "Long the Discoverer of Anesthesia," *Bull. Johns Hopkins Hosp.*, 1897, 8:174; F. W. Packard, "The Discovery of Anesthesia," *The*

tance of the first public demonstration of ether anesthesia, on 16 October 1846, at the Massachusetts General Hospital.

Just prior to World War II professional anesthesiologists were affiliated with some of the leading American hospitals for the first time. American surgeons entering military service during 1941 had physician anesthesiologists serving with them in the military hospitals. I had this experience in association with Lt. Stevens J. Martin, M.C. (later Major), who had been associated with Ralph Waters and Emery Rovenstine. Following the entry of the United States into World War II, however, a number of university affiliated hospital units were mobilized without trained anesthesiologists on their staffs.

Beecher has given a concise account of the shortage of anesthesiology personnel in the United States prior to the entry into World War II.[2] Acting as the consulting anesthesiologist for the North African Theatre of Operations, the site of the first prolonged fighting against the Western Axis Powers, Lt. Colonel Beecher, M.C., had a difficult task in providing adequate personnel for the forward medical units. His account carries over to the problems in the later Mediterranean Theatre after the invasions of Sicily and Italy.

The European Theatre of Operations provided further problems in supplying anesthesia personnel in the most critical positions. With the onset of the campaigns of 1944–1945, great demands for the care of the wounded in the combat zone and in the communication zone in the United Kingdom were present. Colonel Ralph M. Tovell, M.C., did outstanding work in providing the personnel at the points requiring the most competent anesthesiologist. It should be noted that at the height of combat there were 129,000 patients occupying hospital beds in the United Kingdom. Not all of these patients had sustained battle wounds.

Prior to the onset of ground combat in the European Theatre, Colonel Tovell had organized training courses for medical and nursing anesthesia personnel.[3] With the onset of combat operations after 6 June 1944, the aforesaid problems increased with many changes of staffing. I had opportunities to observe a number of such adjustments, one of which resulted in my association for nine months with an extremely competent anesthesiologist, Major Lawrence F. Schuhmacher, M.C., who had arrived in the United Kingdom with another unit after two years in Iceland. Major Schuhmacher had completed his training as an anesthesiologist at the Lahey Clinic just

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History of Medicine in the United States (Philadelphia, PA: J. B. Lippincott Co., 1901), pp. 466–482; J. C. DaCosta, "Crawford W. Long," *Selections From the Papers and Speeches of J. C. DaCosta* (Philadelphia, PA: W. Saunders Co., 1931), pp. 276–296.

2. Henry K. Beecher, "Anesthesia for Men Wounded in Battle," *Medical Department United States Army in World War II, Vol. II* (Washington, D.C.: Office of the Surgeon General, Department of the Army, 1955), pp. 57–59.

3. Ibid., pp. 581–621.

prior to entering the military service. The nurse anesthetists were very happy in their duties with Major Schuhmacher.

In conclusion, the great expansion of the anesthesiology profession in the United States following World War II had certainly been in large part due to the war-time experience of the medical profession.

Very sincerely yours,

George N. J. Sommer, Jr., M.D.
September 1989

[Dr. Audrey Davis replied to Dr. Sommer with the following letter, which she has kindly allowed us to reproduce.]

Dear Dr. Sommer:

Thank you for the information regarding the practice of anesthesiology and the use of anesthesia. I am sure there is a great deal of experience such as you have noted which deserves careful evaluation and assessment. I am aware of the war time explosion of anesthesia personnel (if I may use the term) and the subsequent impact on hospital anesthesiology departments. At least a book is needed to properly tell the story of anesthesia development and my little paper only set forth a few items which I do not think are generally appreciated or understood. But indeed what you have to add is also worth discussing. I am especially grateful for the inclusion of your own experiences, which is the way good history gets told — through eye witnesses and their comments.

Have you written any articles on the topic which I might see? I am always interested in learning more about the practice [of anesthesiology] and the myriad people associated with it.

I do not deal with the Long-Morton-Wells debate about the discovery of anesthesia. I think there is much that has been written about this and it would be foolish of me to repeat what is available elsewhere. Surely Long came first by virtue of the date he used the substance, but Morton made the chemical ether practical in the sense that everyone began to use it after he publicized it. Both contributed to the use of anesthetics and Wells, poor man, gave his life in the pursuit of justice toward his claim as a discoverer of an anesthetic. The substances are so valuable and crucial to western medicine that it is not surprising to find that three people were involved in the introduction of anesthetics. And as you know, many others developed or introduced many other anesthetic agents since then.

I am glad to know of your interest in the subject, and thank you for your comments.

Sincerely,

Audrey B. Davis, Ph.D.
September 1989

Medicine and Astrology in Elizabethan England: The Case of Simon Forman

BARBARA H. TRAISTER

Simon Forman regarded himself as a physician, astrologer, alchemist, magician, and writer. Details of his life and flourishing London medical practice are contained in some 40 sixteenth-century manuscripts written by Forman over the course of 30 years, and housed since the seventeenth century in the Bodleian Library in Oxford. About 70 percent of the material in these manuscripts is medical and astrological. Included among the medical papers are several of Forman's casebooks, daily records of his medical patients and astrological clients. In Tudor England, the boundary between medicine and astrology was not clearly drawn. Thus, though this essay focuses on Forman's medical practice, it will inevitably deal with astrological material as well.

Forman's personal life was so colorful that its details have always overshadowed his professional life. Forman made both firm friends and implacable enemies. He has been accused in literature by such luminaries as Ben Jonson and Nathaniel Hawthorne of being a quack, a seller of love potions, and a demonic physician. In a number of English history books he appears as the provider of poison in the notorious Overbury murder which rocked the court of King James. This charge has always seemed particularly unlikely, since Forman had been dead for two years before Overbury, imprisoned in the Tower of London, succumbed to a poisoned enema.

In the nineteenth century, James Orchard Halliwell planned to edit and publish Forman's autobiography and personal diary for the English Text Society. When he examined it closely and found it contained not only all the fascinating customs and important biographical notes that had first attracted his attention, but also a faithful account of Forman's sex life, he quickly curtailed his publication plans and printed only 105 copies with "for private circulation only" printed on the title page.[1] The twentieth-century scholar, A. L. Rowse, who suggestively sub-titled his book on Forman, *Sex and Society in Shakespeare's Age*, focused primarily

1. James Orchard Halliwell, ed., *The Autobiography and Personal Diary of Dr. Simon Forman* (London, 1849).

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Figure 1. Simon Forman, astrological physician (1552–1611).
From A. L. Rowse, *Simon Forman: Sex and Society in Shakespeare's Age* (London: Weidenfeld and Nicolson, 1974).

on Forman's sexual exploits and the important patients whom he treated, and wrote very little on his extensive practice and the medical, astrological, and alchemical writings which Forman spewed forth.[2]

Even the historian Michael Macdonald, in his 1981 book on the medical practice of Forman's friend and "scoller" Richard Napier, a pious country rector, followed Rowse's lead and emphasis. Crediting Forman with arousing Napier's interest in astrology, Macdonald wrote:

> [Napier] became interested in practicing astrology in 1597 when on a visit to London he consulted the notorious Simon Forman about some property that had been stolen. Forman possessed a mesmerizing personality and the sexual appetite of a goat, and he made himself the most popular astrologer of his time. His chaotic moods and exuberant immorality were precisely opposed to Napier's somber chastity, but soon Forman was instructing his new friend in every branch of the astrologer's art: finding lost and stolen goods, predicting marriages and diagnosing pregnancy, treating all the maladies of mind and body.[3]

Given all the judgments made about Forman, it is perhaps only fair to allow him to speak for himself and to give a few necessary biographical details. Forman was obsessed with telling his own life story; autobiographical bits and pieces, poems, diaries, are everywhere among his papers. The following account, written in 1609 about two years before his death, is one of his most succinct autobiographical sketches.

> **The issue of Simon Forman**
>
> Simon Forman the son of William Forman and of Marie Ratewe was borne 1552 the laste of december being Saturdai and newiars Eve at night at 45 minutes after 9 of the clocke and was just 11 years old when his father William died the sam night [on Simon's eleventh birthday]. This Simon when he was 9 yeares old and 3 quarters was set to scolle at michelmas. And at 12 years old he put himself an apprentice because his mother loved him not nor would maintain him to scool. At 17

2. A. L. Rowse, *Simon Forman: Sex and Society in Shakespeare's Age* (London: Weidenfeld and Nicolson, 1974).

3. Michael Macdonald, *Mystical Bedlam: Madness, Anxiety and Healing in Seventeenth-Century England*, Cambridge Monographs on the History of Medicine (Cambridge: Cambridge University Press, 1981), p. 25.

years and a halfe he went from his master and went to scolle again. And because he had no maintenance he lefte of and becam a scolmaster at 17 and 3 quarters. And having gotten som 40sh [40 shillings] at 18 and a quarter he went to Oxford and ther lived as a pore scollar for saking all his frinds. At 20 years he becam a scolemaster again and began to study astronomy & phisicke magick & philosophie. Wherin he profited & prospered mightily and in chirurgerie [surgery] and other artes, for the which he suffered moch troble afterwardes and lost all his goodes and bockes 3 times. He travelled much in to the Eastern countries to seke for arte and knowledge and was often at sea. And in his returne after the portugal voyage 1589 at michelmas he came to London wher he dwelled at the stone house in Philpote Lane som 14 years. And had moch troble among the doctors for his practice for that he was not free among them nor a graduat in the university, and was by them 4 times imprisoned and once fined. Yet at the laste did overthrowe them all both in the common lawe and also in the chancery to their great shame and then in the yeare of our lord 1603, the 27 of June he being at Cambridge was graced a doctor in phisicke and astronomy, under the sealing auctority of the university. And from that time after none for arte durste meddle with him any more. Then he lefte London and went to Lambeth town a mile off and there he lived many years to the profit and benefit of many. This was he that had the true course of astronomicall physicke.

This Simon in the yeare of our lord god 1599 took to wife Jean [pedigree omitted] by the which Jean the said Simon Forman had issue a daughter named Doritie borne unto him 1605. In the 53 year of his age. His daughter Dority died at Candelmas after she was borne at half yere old. After this she conceyved again by the said Simon and she bore him a sonne named Clemment who was born 1606 the 27 day of October. He was the greatest child of perseverance wit understanding memory and reason at 2 years old of them that ever lived. And so he persevered and at 5 years old he was able to read English and full of spirit. All air. He was so full of action and would never stand still. God bless him. Divers times like to been drowned brained and overrun with horses before he was 4 years old.[4]

With his encomium to his son, Forman stopped abruptly; this version of his life, like almost all his other literary projects, remained

4. Ashmole MS 208, fol. 225v, Bodleian Library, Oxford University.

unfinished. What he did finish, however, were a number of medical and astrological tracts, none of which was ever published, but several of which were prepared in fine copy hand, either to be given to a printer or to be handed around among his friends. The most interesting of his medical tracts are an essay on gynecology, one on melancholy, and one on the plague.[5] From the point of view of medical history, however, Forman's most valuable papers are his casebooks: methodically kept daily records of his medical and astrological practice.

Before we turn to the Forman casebooks and an assessment of what they tell and what they fail to tell about Renaissance medical practice, a brief overview of Tudor medicine may help us put the casebook information in perspective. According to English common law, anyone could practice medicine as long as the patient consented. As might be expected, given this latitude, a wide range of medical practitioners were to be found: physicians, surgeons, apothecaries, midwives, cunning men and women, as well as outright quacks.[6]

At the top of the medical hierarchy stood the physician. Physicians had been distinguished from surgeons ever since the thirteenth century when Pope Innocent III declared that ecclesiastics, who were the educated men of the society and thus also the medical practitioners, could not shed blood. Although Forman claimed in a diary entry in 1581 to have spent his year practicing both physic and surgery, and although he claimed skill in "chirurgy" in the autobiographical sketch quoted above, records of his cases in the 1590s indicate that his practice was then entirely that of a physician.[7] He saw remarkably few accident victims or wound cases, and rarely dressed external injuries or set bones.

The Renaissance, which we associate with progress in most areas of human knowledge, did not immediately witness improved medical practice. Indeed, with the retrieval of the classical medical texts, physicians felt that all men needed to know about medicine was available to them. Once he had mastered the corrected texts of Galen, Hippocrates, Dioscorides, and other medical "greats," the physician saw little need to learn anything else. Full of reverence

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5. On gynecology (Ashmole MS 390, fols. 175r–185r); on melancholy (Ashmole MS 355, fols. 115r–146v); on the plague (Ashmole MS 208, fols. 110r–134r).

6. Harold J. Cook, *The Decline of the Old Medical Regime in Stuart London* (Ithaca: Cornell University Press, 1986), pp. 20–28.

7. Ashmole MS 208, fol. 36v. See also, Halliwell, *The Autobiography*, p. 16.

for the wisdom of his medical predecessors, the Tudor doctor turned increasingly to his books and apparently paid little attention to the clinical evidence he might have gathered from his own patients.

The prevalent medical theory of the time was the Galenic theory of humoral medicine, which treated man as a balance of the four elements of fire, earth, water, and air, with the corresponding qualities of heat, cold, moistness, and dryness. The mix of these elements was a bit different in each human being and explained human temperaments: the choleric, the melancholic, the sanguine, and the phlegmatic. If an individual's elemental mix got seriously out of balance, the person got sick. Curing the patient involved restoring balance, not by treating a particular diseased area of the body, but by treating the body as a whole.

Restoring this balance usually involved letting blood, purging, or making the patient vomit. The medicines prescribed were largely herbal compounds, often made of very complex mixtures of natural substances. Most physicians did not mix their own medicines but ordered them prepared by an apothecary. There were exceptions; some physicians, particularly those in the country where apothecaries seldom found it profitable to set up shop, mixed and sold their own medicines. Although he was an urban physician, Forman mixed his medicines regularly and sold them directly to his patients as part of their consultation.

All physicians thought a knowledge of astrology was essential for the proper administration of medicine (when doses should be taken) and for proper blood-letting (what vein should be cut). But astrology's efficacy for diagnostic purposes was much debated. Some physicians, Forman among them, practiced a kind of astrology known as "judicial astrology" which made judgments about the cause of the illness and predicted its course by casting the patient's horoscope. Other physicians believed that such astrological diagnosis was unreliable, though they continued to rely on astrology in the prescriptive, non-judicial aspects of their practice.

These physicians chose instead to examine their patients' urine, checking its color, odor, sediment, and density. Indeed, the badge of the doctor, in nearly every portrait of him in the period, was the bottle of urine which he examined. Even a physician like Forman, who wrote fiercely in defense of astrological diagnosis as opposed to what he called "pisspot" diagnosis, received the urine of his patients and examined it. A patient's willingness to provide urine

Figure 2. An astrological consultation, circa sixteenth century.
Courtesy of the Newberry Library.

appeared to be Forman's measure of the patient's seriousness about the consultation.

Diagnosis by horoscope or by urine sample rather than by examination of the patient meant that patients did not have to be present at the consultation. Their urine could be sent, and their age (necessary for reading the horoscope) could be reported by a relative, a friend, or a servant. In fact, physicians of the period did not see many of the patients for whom they prescribed. Forman saw about 70 percent of his patients, usually at his own residence, though occasionally he recorded making a house-call. The other 30 percent were diagnosed and prescribed for in absentia.

This "hands-off" approach seems, in fact, characteristic of both the medical practice and medical education of Tudor physicians. For example, until the middle of the sixteenth century, presence at dissections was not required, or sometimes even possible, for English medical students. At that time, influenced by the more progressive continental medical schools, the two English universities, Oxford and Cambridge, obtained the right to a limited number of criminal corpses annually for anatomical dissection. But even when the requisite corpses were made available, attendance was poor, and there is evidence that the witnessing physicians stood far away

and were as little involved in the process as possible.[8] Not until Vesalius's anatomical revisions of Galen were widely publicized at the beginning of the seventeenth century, did a physician's first-hand knowledge of human anatomy begin to seem desirable; until then, physicians knew all they needed to know from their studies of Galen.

The challenge to anatomical theory was not the only one issued to Galenism in the sixteenth century. The Swiss-German physician Paracelsus, writing early in the 1530s, attempted to supplant Galenic humoral theory with a new focus on specific disease or injury. This style of medical practice obviously involved a hands-on approach to medicine: each patient had to be examined so that his trouble might be accurately pinpointed. Perhaps even more important for the development of medicine was the Paracelsian stress on chemical or alchemical medicines, that is, compounds mixed from metals and salts rather than the herbal simples used so universally in Galenic practice. Though the Paracelsian movement was slow to catch fire in England, there is evidence that by the late sixteenth century some English physicians were incorporating aspects of Paracelsian medicine into their own practice.[9]

In the winter of 1590–1591, for example, Forman copied part of a Paracelsian treatise from a manuscript which he borrowed from William Fallowfield, who had himself copied it from someone else in July of 1590. Forman also showed an increased interest in alchemy from the mid-1590s to the end of his life, in 1611. This new interest may be partly explained by his improved financial situation; for the first time he could afford the expensive raw materials that alchemy required. His medical compounds became more complex as he began to include metals and salts along with the herbs and simples which had always been the mainstay of his medicine.

One important arena of change was medical education and licensure. At the beginning of the sixteenth century, English medical education lagged far behind that of the continent in general, and

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8. George Clark, *A History of the Royal College of Physicians of London,* 2 vols. (Oxford: Clarendon Press, 1964). Volume one, pages 84 and 122, notes the few other groups that were permitted criminal cadavers for dissection.

9. Charles Webster, *From Paracelsus to Newton: Magic and the Making of Modern Science,* The Eddington Memorial Lectures, 1980 (Cambridge: Cambridge University Press, 1982), pp. 2–4. See also Allen G. Debus, *The English Paracelsians* (New York: Franklin Watts, 1965), and Paul H. Kocher, "Paracelsian Medicine in England: the First Thirty Years (ca. 1570–1600)," *Journal of the History of Medicine,* 1947, 2:451–480.

Italy in particular. Both Oxford and Cambridge gave M.D. degrees, but their faculties were small and the degree took a long time to complete. The student interested in receiving good medical training took a seven-year M.A. at one of the English universities, then went to the continent for medical study, passed the exams there, and returned to England to "incorporate" his continental degree at Oxford or Cambridge.[10]

One of the students who followed this procedure was Thomas Linacre, who became court physician to Henry VIII and encouraged the King to support the foundation of the London College of Physicians. Established by royal statute in 1518, the College was immediately given the responsibility of overseeing medical care in the City of London. The College became a licensing body with the power to fine or imprison anyone practicing medicine without a medical degree from Oxford or Cambridge or without the College's own license, granted only after a formal examination by members of the College. Their jurisdiction extended through the City proper and for a radius of seven miles outside the City limits. Linacre and Henry VIII obviously intended that this arrangement would improve the quality of medical care given London citizens. But since the number of physicians who belonged to or were licensed by the College was very small in proportion to the population of London, in practical terms the College made little impact on the sizeable number of folk who practiced medicine in one way or another within London.

Indeed, had the College been successful in suppressing all "unqualified" practitioners, vast numbers of Londoners would have had no one at all to consult about medical problems. The College was able, perhaps, to restrain the most notorious or the most financially successful of the unlicensed practitioners (it tried repeatedly and unsuccessfully to restrain Forman), but most went unnoticed by the College. Also, it seems probable that some of those examined and punished for unlawful practice were prosecuted for political and social reasons rather than because they were less medically qualified than those whom the College tolerated.[11]

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10. Clark, *A History of the Royal College, Vol. I*, pp. 34–46. See also, James L. Axtell, "Education and Status in Stuart England: The London Physician," *History of Education Quarterly*, 1970, *10*:141–159.

11. A discussion of non-licensed practitioners appears in Margaret Pelling and Charles Webster, "Medical Practitioners," in *Health, Medicine and Mortality in the Sixteenth Century*, Charles Webster, ed., Cambridge Monographs on the History of Medicine (Cambridge: Cambridge University Press, 1979), pp. 165–235.

Members of the College of Physicians, which by the 1590s had grown to number about 30, were the elite of the English medical community. Many of them were attached to the Court, and nearly all were urban physicians, practicing in London. Although the physician did not yet have the prestige which he has achieved in the twentieth century, medicine was clearly a profession offering the possibility of considerable wealth and status. Elite physicians were most frequently attached to the royal family or to prominent members of the nobility by a yearly retainer. For this fee, the physician would provide medical service to the entire family for the year. In addition to the fixed fee, such physicians received extras in the form of clothes, meals, or gifts.

Goodall's *Historical Account of the College's Proceedings Against Empiricks* preserves a record of the practitioners called before the London College of Physicians on charges of unlawful practice. Goodall also records the astronomical fees that some of these people had charged for "cures." For example, in 1590, Margaret Peacock came before the College to accuse a practitioner named Forrester of killing her husband by a vomit, "prescribed him at 5 in the afternoon one day, which gave him an hundred stools and wrought so violently by Vomit that he died next evening at 9 a clock, wallowing in his own blood and humours discharged by the violent operation of the forementioned medicine."[12] For his "cures" Forrester charged between five and twenty pounds. There was no real standard for fees; physicians, licensed and unlicensed, charged what the market would bear, and some Elizabethans were clearly willing to spend a disproportionate amount of their income in the quest for health.

Forman did not regularly record his fees. In 1597 (a year for which I have calendared all his case records) he noted only 20 fees, ranging from six pence for a purge prescribed to a man complaining of pain and fever to eighteen shillings for a purge prescribed to a woman diagnosed as suffering from "the mother" (an hysterical condition which was thought to occur when the womb rose in a woman's body).[13] In a manuscript dated 1601, he recorded a number of fees, and his prices seem to have risen slightly, though there was apparently no standard fee for a purge or a glass of medicine.

12. Charles Goodall, *The Royal College of Physicians of London . . . and an Historical Account of the College's Proceedings Against Empiricks and Unlicensed Practisers* (London, 1684), p. 335.

13. The 1597 casebook is Ashmole MS 226.

It is probable that Forman adjusted his fees according to what his clients seemed able to pay. Occasionally Forman was very detailed about how he computed his fee. For curing Mr. Osborne's son, he prepared an itemized bill of 39 shillings. This cure involved three house calls to a distant part of the city, two purges, five days of preparative medicines getting the boy ready for the purges, one dose of strong water, and one "comfortable drink." Sometimes physicians gambled on their ability to cure the patient, agreeing to give back the patient's money if the treatment was unsuccessful. Such arrangements had originally been forbidden by the London College of Physicians, but in the early 1600s the College amended its regulation to allow them, provided the patient agreed. Forman noted a few such agreements. For example, Jackanan Vampena, a difficult case whom several doctors had failed to cure, paid Forman six pounds down and agreed to pay another six pounds when the cure was complete. "If she be not well," Forman wrote, "I must give her 5 pounds again." Forman sometimes had to return money. After telling Katharine Barnes she was not pregnant, he refunded her money when she did prove to be with child.[14] Forman became financially comfortable, if not wealthy, through his medical practice. His estate at his death was worth over one thousand pounds, and he clearly did not skimp in his standard of living.

Had we a complete run of Forman's casebooks, we might be able to document how he amassed his money. Unfortunately, no casebooks from the last decade of Forman's life survive, although evidence in some of his other manuscripts indicates that he continued to keep careful case records until his death. Included in the Ashmole collection are six volumes of casebooks covering the period from March 1596 to November 1601. Each has from three hundred to four hundred closely-written leaves on which appear patients' names, addresses, ages, symptoms, diagnoses, medicines or procedures prescribed, and occasionally fees charged.

Forman's casebooks appear to be extremely unusual for the period. George Clark writes that English physicians began keeping detailed case records only after the eminent physician Theodore Mayerne arrived in England several years after Forman's death. Mayerne, who became physician to King James I, argued that re-

14. Mr. Osborne's son (Ashmole MS 411, fol. 102v); Jackanan Vampena (Ashmole MS 411, fols. 99v and 115r); Katherine Barnes (Ashmole MS 236, fols. 73v and 113r).

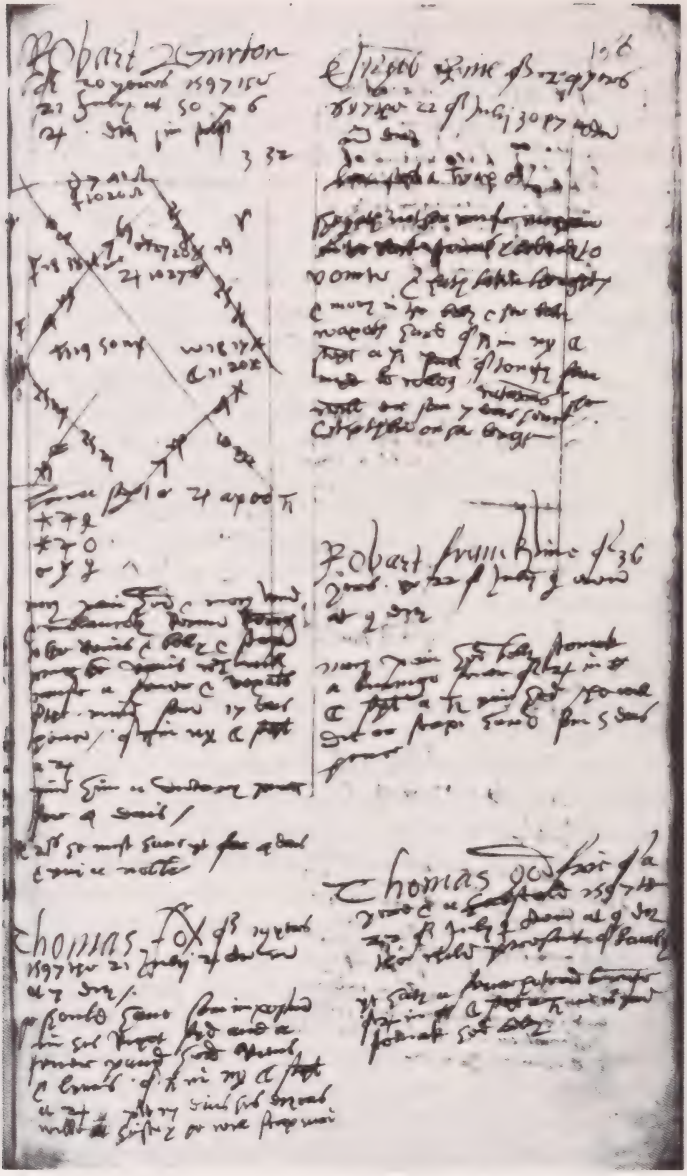

Figure 3. Simon Forman's case notes on Robert Burton, author of *The Anatomy of Melancholy*, Ashmole MS 226.
Courtesy of the Ashmole Collection, Bodleian Library, Oxford University.

cord-keeping was part of a physician's duty and influenced English physicians to follow his lead.[15] In the years before Mayerne, however, detailed record-keeping was apparently regarded with suspicion by the London College. Goodall's account of one of Forman's appearances before the College mentions his record-keeping as a negative factor:

> After this, Mr. Pelham, a Physician, and another person acquainted the College with the notorious cheats that Forman made use of for deceiving the people, as his enquiring the Patient's name and place of habitation; then erecting a figure; after that, passing a judgment of the disease and event thereof; then prescribing remedies & etc. Upon which the Censors order'd a Citation for his appearing before them; But he refusing to appear unless he might have their promise for his safe return, he was prosecuted at Law according to direction of Councell, de mala praxi & illicita.[16]

In his book of instruction on astrological physic, probably prepared for Napier's use, Forman explained in great detail why he kept detailed records: to prevent people from deceiving him, to remember what he had prescribed formerly so that he did not give incorrect medicines or doses, and to record enough details to make accurate judgments.

Forman passed on his record-keeping methods to Napier, whose casebooks are set up in almost identical fashion. Aside from Napier's, there exists no other cache of early English medical records with which we can compare Forman's collection. One anonymous North Riding physician left his financial records for 1609, including a one or two word identification of each patient's complaint, written on the fly-leaf of a book of anatomy.[17] Forman was still practicing, though we have only fragmentary records of his cases at that time. The North Riding record dramatizes the difference between the size of the two practices. In 1609, the North

15. Clark, *A History of the Royal College, Vol. I*, p. 197.

16. Goodall, *The Royal College of Physicians of London*, p. 339.

17. W. R. LeFanu, "A North-Riding Doctor in 1609," *Medical History*, 1961, *5*:178–188. A few patient records also exist in the manuscript notebook of John Crophill, a fifteenth-century physician. Descriptions of that MS indicate, however, that only a few patients are named, no symptoms or diagnoses are recorded, and what were once thought to be patient fee records are actually rent records. See Ernest William Talbert, "The Notebook of a Fifteenth-Century Practicing Physician," *TSEL*, 1942, *21*:5–30, and James K. Mustain, "A Rural Medical Practitioner in Fifteenth-Century England," *Bull. Hist. of Med.*, 1972, *46*:469—476.

Riding physician saw a total of 188 patients; Forman in 1597 had 1,735 consultations, nearly 10 times as many. The North Riding physician thanked God that he had earned 17 pounds 6 shillings from his practice; Forman was happy in 1594 that he had earned 50 pounds in one quarter of the year. Forman's yearly total of patients is in line with the approximately two thousand consultations which Macdonald computed for Napier's practice in 1610 and again in 1620.[18]

Forman's records reveal the demographics of his practice as well as the sorts of problems for which astrological physicians were consulted. Although contemporary references to Forman tend to stress his astrological, as opposed to his medical practice, his casebooks show that astrological questions accounted for a rather small percentage of his workload. Of the 1,735 consultations in 1597, 193 (or 11 percent) were for non-medical advice. Also surprising perhaps, given Forman's reputation as a purveyor of love potions to ladies, only 11 percent of his women clients came for non-medical visits, while 13 percent of his male clients were on non-medical business. The purposes of these astrological consultations varied widely: Mr. Broughton hoped to be made Dean of Chester Cathedral and came repeatedly to ask about the chances of his rivals for the position. Forman clearly came to regard him as something of a nuisance after a while and simply scrawled "Mr. Broughton for Chester" in the margin. Broughton alone accounted for five percent of the non-medical questions asked. Men tended to consult Forman about the risks of going to sea. Sir William Monson was about to undertake a voyage in the spring of 1597, and he and a number of his crew came to ask Forman about the success of the venture. Women, on the other hand, frequently asked about husbands missing at sea. Because no age was necessary in casting a non-medical horoscope and because no medicine needed to be prescribed, Forman recorded fewer details about his astrological clients, often omitting his own answer which was frequently a simple yes or no. Of the non-medical questions about which Forman provided enough information for us to understand the issue, 16 percent of the men's and 40 percent of the women's questions involved love and marriage; whether someone loved the client or whether the client should marry a particular person constituted about 25 percent of all the astrological questions asked. Of the non-medical cases,

18. Macdonald, *Mystical Bedlam*, p. 26.

17 percent were about lost property; an additional 17 percent were about whether to take a particular journey (I include the sea voyage questions here, but some people simply wanted to know whether it was safe for them to take a journey into the country). Other questions ranged over many issues such as where would be the most profitable place to locate a business or build a house, or whether the client could expect success in his quest for a particular position or in a lawsuit. Only six percent of Forman's astrological clients wanted a nativity (a reading of their birth horoscope).

In general, astrological consultation does not seem particularly important to Forman's practice, and thus far I have not found any mention of what Forman charged for such consultations. Mr. Broughton returned on an almost daily basis, as did a couple who had lost their dog with a blue and green velvet collar. They came at least seven times for advice on where to look for her. Given such frequent repeat visits for rather minor advice, Forman's fees cannot have been very high for astrological consultations.

The real backbone of Forman's practice was medical. He records more information about his sick patients than he did about those seeking astrological advice. About 7.5 percent of his consultations in 1597 were for children under sixteen (130 visits). Forman indicates that 45 (35 percent) of those children were actually present for the consultation, while 52 (40 percent) were inquired about by parents, siblings, or other relatives. For the remaining 25 percent of the children, I cannot tell from Forman's entries whether they were present for the diagnosis or not.

In that same year, about 15 percent of Forman's clientele were 50 years or older (245 patients), leaving over 75 percent of his patients in the 16 to 49 year range. This pattern is very different from what we expect today, when the very young and very old account for the majority of medical visits. The difference in life expectancy, of course, explains the relatively small number of patients over fifty. As for children, they probably got sick just as frequently, or more frequently, than they do today. But the literature of the period suggests, and Forman's records seem to bear out, that parents tried not to invest too much in a child's survival until it reached an age where survival was indeed fairly likely. Since the favored medical treatments of the period, purging and bleeding, were generally not recommended for children, perhaps parents felt that there was little physicians could do for a sick child. In any

case, Forman's casebooks indicate that he treated children fairly infrequently, and Napier's casebooks show a similar pattern.[19]

Fifty-four percent of Forman's cases were women 16 years and over, and 38 percent were men 16 years and over. The high rate of childbirth-related illnesses accounts for the difference in the numbers. Twelve percent of the women who consulted Forman either came to ask whether they were pregnant or were diagnosed by Forman as pregnant during the consultation. Many of Forman's other women patients reported gynecological problems: some had not menstruated for years; others had what were apparently vaginal infections involving itching, "mattering," and burning; a number reported they had been sick since their last childbirth — which might have been as much as five or six years before. Over 50 percent of Forman's women patients reported some female-specific symptoms, although in a number of these cases it is difficult to determine whether the symptom was a primary or secondary part of the complaint that brought the woman to Forman. By contrast, only five percent of the male patients reported male-specific symptoms: swollen genitals; "wasting of nature;" gonorrhea; itch, pimples or infection of the penis.

When the sex-specific cases are removed from consideration, men and women have similar problems. The most often reported symptoms which Forman records include general pain, gravel in the reins (kidney stones), fever, vomiting, scouring (diarrhea); costiveness (constipation); cough; stuffed in the stomach and lungs (congestion); idle-headed; taken cold, grief, or thought; fearful. It is very difficult to make generalizations about Forman's lists of symptoms or diagnoses, partly because the meaning of words has changed a good deal in the interim. Forman used the term "consumes," for instance, not just with the disease tuberculosis in mind (though recent research suggests that tuberculosis was a problem in urban areas as early as the Renaissance) but rather for any wasting condition.

Also, it is frequently unclear whether the symptoms Forman recorded were relayed by the patient or his messenger or were derived from the horoscope Forman cast for each patient. Some were so specific as to be clearly the patient's own complaint: has a dead palsey in his left arm and leg; water red as blood; buboes swollen in his groin; surfeited with raw roast beef; vomited a worm

19. Ibid., pp. 42–43.

of a yard long. Others were formulaic and recurred repeatedly: much pain in reins; a great cough; much griping in the belly; consumeth. Such symptoms were, of course, common and might well have been individual complaints, but Forman sometimes recorded essentially the same symptoms for a whole series of patients on a single day. Such symptoms may have been determined more from the position of heavenly bodies on that particular day than from the complaints of individual patients.

Forman's recorded diagnoses are even more problematic, at least in terms of modern medicine. Most of his diagnoses were humoral in nature: "melancholy mixed with red cholor;" "tough flem;" "a venemous humor." Quite often, Forman gave the name of a specific condition or disease: plague, pox, measles, gonorrhea, sciatica, pleurisy, yellow jaundice, dropsy, strangury, and the like. Even though the names are familiar to us today, there is uncertainty about Forman's diagnoses. In cases where he gave a full list of symptoms, we can make a reasonably good judgment about his accuracy; but in many cases he diagnosed without listing symptoms, just as he often listed symptoms without arriving at a diagnosis. It is impossible to compile accurate statistics because Forman was inconsistent in the kind of information he chose to record.

Forman was somewhat more systematic in listing his treatments, which he recorded in about 35 percent of his cases. Like most physicians of the period, his chief responses to illness were bleeding and purging, with dietary drinks or pills following closely behind. Only in the case of children did he prescribe pills or liquid medicine more frequently than purges or bleeding. He ordered purges for only 16 percent of his child patients and bled only two percent of them, these being almost always teenagers. Among the adults, men were bled and purged more frequently than women.[20] He purged 30 percent of his male patients as opposed to 25 percent of the females. He bled rather conservatively for the period: 13 percent of his male patients and eight percent of the women. In many cases he recorded a prediction rather than a prescription. "He will die shortly" was a common prediction, often with specific time limits "within 5 days or 5 weeks." He also predicted, through the

20. In this practice, Forman is in line with recommended Galenic principles; see Peter Brain, ed. and trans., *Galen on Bloodletting: A Study of the Origins, Development and Validity of His Opinions, With a Translation of the Three Works* (Cambridge: Cambridge University Press, 1986), pp. 81–82, 87.

use of judicial astrology, when diseases would reach their height or when an alteration for better or worse could be expected.

Forman made some attempt to keep his records up to date. As he learned the fate of patients, he often turned back to their cases to add annotations. For example, James Hoon, age 54, came at the end of June 1597, with a fever, "scouring," and melancholy. Forman ordered him bled and predicted "he will end or mend soon." A note in another ink recorded: "died first of July." Perhaps the most dramatic example of back-noting was the case of Susan Bolter, age 25, of whom Forman reported on 13 July 1597: "she tok it [what malady 'it' refers to is not clear] in childbed;" his next comment was "lived not 24 years; moch pain hed stomake & at harte & reins, a fever & in her legs. She is weke & will scape hard" [Forman's standard phrase for indicating that he thinks death is likely]. "She may live," he went on, "she hath taken moch ill phisicke & she is very weke & full of pain." A note was added on 29 February 1600 (nearly three years after the first consultation); "she did escape," Forman wrote, "and live & she wed & cam to me herself & told me of it."[21]

Other information, such as the rate of patients' return visits, can be tabulated from the casebooks. Some of Forman's patients were regulars and returned repeatedly, especially women who were anxious to know if they were pregnant. The geographical range of his clients can also be estimated from the addresses he recorded in approximately 25 percent of the cases. Not surprisingly, most of his clients came from London itself, but a number came from outside the city: Greenwich, Kent, Buckinghamshire, Blackmore in Essex, Donfield in Surrey. Like Napier, Forman apparently attracted clients from a wide range of territory; he was not simply the local physician in a particular section of London, or later in Lambeth.

Another interesting question concerns the social class of Forman's clientele. Here A. L. Rowse's book is helpful, in that he has identified many of Forman's high-ranking clients. Despite his large number of socially prominent clients, however, it is clear that Forman treated a number of patients from the working classes, including sailors, servants, tailors, and butchers. Less than 10 percent of Forman's clients were identified in his casebooks by rank or by profession. Assuming that his innate snobbery would have led him to record such information chiefly for wealthy or important

21. Hoon is Ashmole MS 226, fol. 134v, and Bolter is fol. 146v.

clients, it is safe to assume that many patients whose rank or profession went unrecorded were lower class folk. The occupation that Forman recorded most frequently was that of servant, but almost invariably in such cases he recorded the name of the employer rather than that of the patient: "Mr. Stymer's man;" "Goodwife Utley's maid." He may have hoped to attract other clients from the same household, perhaps even the master and mistress themselves. Thus, I suspect that the professions which are recorded represent disproportionately the upper level of Forman's clientele, and I disagree with Rowse that Forman's practice was primarily among the rich and the well-to-do tradesmen.

Study of Forman's casebooks allows us to examine some common assumptions about medical care in Tudor England. That children were relatively infrequent medical patients is borne out by Forman's records.[22] That women outside the nobility were reluctant to consult male physicians, preferring to treat themselves or to consult midwives, is certainly contradicted in Forman's practice. The notion of individual doctors having specialties, suggested in Macdonald's study of Napier, who was noted for his treatment of mental illness, is supported by Forman's casenotes, which show that a disproportionate number of his consultations were gynecological. Finally, the notion of sixteenth-century medicine as a consumer's market with patients frequently shopping from doctor to doctor and bargaining about fees also finds support in details from Forman's cases.

Though Forman was never accepted by the London College of Physicians, the stability of his 22 year urban practice and the number and loyalty of his patients suggest that Forman was regarded as a medical professional by a considerable segment of his society. Thanks to his passion for record-keeping, we can learn a good deal about how medical care was delivered in late sixteenth-century London, in the years just before the "new science" and men like William Harvey made significant changes in medical knowledge and its application.

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22. For speculation about why children are so little represented as patients in the records of physicians such as Richard Napier (and Simon Forman) see Margaret Pelling, "Child Health as a Social Value in Early Modern England," *Social History of Medicine*, 1988, *1*:138–140.

The Medicalization of Childbirth in the Twentieth Century

JUDITH WALZER LEAVITT

Today most American women (about 98 percent) deliver their babies in hospitals, accompanied by their physicians, nurses, and sometimes by their husbands and friends. The hospital routine is fairly standard (although of course variations exist among hospitals), and medical protocols have been developed for most exigencies. Many women discuss the possible procedures in advance with their physicians, and within prescribed limits, make certain choices about what might happen to them. Once labor begins, however, some women find that their desires are ignored, either because a different physician happens to be on call, or because the course of labor indicates the necessity of unexpected specific interventions. Usually, because of the need for medical assessment on the spot, more is left to the hospital and the physician than to the woman or her family.

This kind of "medicalized" childbirth is new, a product of the mid-twentieth century. Even though we have come to accept it as normal, the historical record is very clear on how recent a phenomenon it is for physicians to be in control of labor and delivery and for women to bow to their expertise. This paper examines how and why and under what conditions such hospital-based, physician-directed, medicalized childbirth evolved, and aims to give a sense of the extent of change that the present situation exemplifies. In the process, this article explains some of women's criticisms of current medical practice and looks historically at the origins of their contemporary demands.[1]

Traditional Childbirth

For most of human history, childbirth was exclusively a woman's

A previous version of this paper was presented as the Kate Hurd Mead lecture at the meeting of the Section on Medical History of the College of Physicians of Philadelphia on 9 March 1989.

1. This paper is based in large part on my book, *Brought to Bed: Childbearing in America 1750–1950* (New York: Oxford University Press, 1986). Readers are requested to check the book for more complete citations. Direct quotations only will be referenced here.

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event. When a woman went into labor, she "called her women together" and left her husband and other male family members outside. "I went to bed about 10 o'clock," wrote William Byrd of Virginia, "and left the women full of expectation with my wife."[2] Only in cases where women were not available did men participate in labor and delivery, and only in cases where labor did not progress normally did physicians intervene and perhaps extricate a dead fetus. The midwife orchestrated the events of labor and delivery, and the women neighbors and relatives comforted and shared advice with the parturient.

Ebenezer Parkman wrote in the middle of the eighteenth century of one of the 12 times his wife was "brought to bed":

> My wife very full of pain. This Morning I sent Ebenezer for Mrs. Forbush . . . A number of Women here. Mrs. Hephzibath Maynard and her son's wife, Mrs. How, Mr. David Maynard's wife and his Brother Ebenezer's, Captain Forbush's and Mr. Richard Barns's. My son Ebenezer went out for most of them. At night I resign my Dear Spouse to the infinite Compassions, all sufficiency and sovereign pleasure of God and under God to the good Women that are with her, waiting Humbly the Event.[3]

Mary Louise Fowler wrote to her pregnant sister Nettie in 1863, when Nettie was in Europe with her husband:

> I think of you in anticipation of your coming trial. I know you will have all that can be procured under the circumstances, but it would relieve me of great anxiety if you were in our best bed-room where I could nurse you as only a mother or a sister can.[4]

The ethic of a proper childbirth was, for all classes of women in the United States and over a long span of time, a home birth attended by caring, concerned women relatives and friends. As one woman wrote in 1866:

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2. Louis B. Wright and Marion Tinling, eds., *The Secret Diary of William Byrd of Westover, 1709–1792* (Richmond: Dietz Press, 1941), p. 79.

3. Francis G. Walett, ed., *The Diary of Ebenezer Parkman 1703–1782* (Worcester, Mass.: American Antiquarian Society, 1974), entry for 16 February 1747, p. 150.

4. Mary Louise Fowler to Nettie Fowler McCormick, 25 October 1863, McCormick Family Papers, Incoming Correspondence, 1860–1864, Wisconsin State Historical Society Archives.

> A woman that was expecting had to take good care that she had plenty fixed to eat for her neighbors when they got there. There was no telling how long they was in for. There wasn't no paying these friends so you had to treat them good.[5]

To this women's world, husbands, brothers, or fathers could gain only temporary entrance. In an 1836 account, the new father was invited in to see his wife and new daughter, but then "Mrs. Warren, who was absolute in this season of female despotism, interposed, and the happy father was compelled, with reluctant steps, to quit the spot."[6]

The women's world around the birthing bed that is revealed in letters and diaries represents the existence of a specific female group identity among women. Women could write and speak to each other about intimate details of confinement-related care; they could confide their innermost thoughts about their coming motherhood. While nineteenth-century conventions did not permit discourse about such private matters in public, among themselves, in private, women could and did speak freely. Here, in their private writings and around the confinement bed, women identified with each other's concerns, shared their wisdom, and united, as women, in the knowledge that they were not alone in their problems.

The examples of this kind of gender-based sharing are legion. Perhaps its strongest manifestation was that between mothers and daughters, a bond renewed as daughters approached their confinements. Anita McCormick Blaine sequestered herself in her childhood Chicago home in 1890 as she planned for the birth of her first child, where, she wrote, "every chair and table speaks to me of dear familiar times . . . nothing is so sweet as to feel the presence of all it reminds me of." She wrote to her mother Nettie Fowler McCormick: "I never can be able to tell you what peace comes to me from being in this home of all my girlhood now. I know I should feel very differently in any other place. I did not realize what a blessing it would be but I feel it every minute — & I am so grateful that my sweet baby can come to be here — Dearest mother mine — all would be complete if you were here." Anita had prepared thoroughly for her coming confinement, but she missed her mother. Nettie returned the sentiment. "Dearie," she wrote," I wish I were there to thor-

5. Malinda Jenkins, *Gambler's Wife: The Life of Malinda Jenkins, As Told In Conversations To Jessie Lilienthal* (Boston: Houghton Mifflin, 1933), p. 48.

6. Elizabeth Elton Smith, *The Three Eras of Woman's Life* (New York: Harper Bros., 1836), p. 85.

oughly rub olive oil upon your hips, your groin muscles, your abdominal muscles all throughout — in short all the muscles that are to be called upon to yield, and be elastic at the proper time. See how reasonable it seems that they should be helped to yield, and to do their work if they are kneaded by the strong hand of mother, while olive oil is being freely applied."[7] You can see that women's communication was quite explicit, and the roles women played were not just psychological support but also involved very specific duties to aid labor and delivery along. In the words of one observer, women could be counted on to "know what to do without telling," and that was enormously important.[8] As one woman wrote, "Only a woman can know what a woman has suffered or is suffering."[9]

Physician-attended Childbirth

Despite the very female nature of the childbirth experience, women in eighteenth-century American cities who could afford medical aid began inviting male physicians to attend them during labor and delivery. They did so to improve upon — as they thought — their chances of survival and comfort. They had no intention at that time to give over decision making authority to the doctors. They wanted medical help and sought it in very specific ways. Historians have heretofore assumed that, when male doctors began attending normal births, women's birthing networks disappeared.[10] My research showed instead that women continued to help each other and to control childbirth events until birth moved to the hospital, a process we will examine below. The "medicalization" of childbirth did not occur in this early eighteenth-century period when physicians first attended obstetrical cases, or even in the nineteenth century as physicians became established figures in the birthing rooms of mid-

7. Anita McCormick Blaine to Nettie Fowler McCormick, 24 August 1890, Nancy Fowler McCormick Papers, Wisconsin State Historical Society, series 2B, Box 46; Nettie Fowler McCormick to Anita McCormick Blaine, August 1890, Series 1E, Box 459, ibid.

8. Grace Lumpkin, *To Make My Bread* (New York: Macaulay, 1932). My thanks to Mari Jo Buhle for calling this reference to my attention.

9. Mrs. W. H. Maxwell, M.D., *A Female Physician to the Ladies of the United States, Being a Familiar and Practical Treatise on Matters of Utmost Importance Peculiar to Women; Adapted For Every Woman's Own Private Use* (New York: published by Mrs. W. H. Maxwell, 1860), p. 3.

10. See, for example, Catherine Scholten, " 'On the Importance of the Obstetrick Art'," in Judith Walzer Leavitt, ed., *Women and Health in America: Historical Readings* (Madison: University of Wisconsin Press, 1984), p. 150.

dle and upper class American women. Childbirth was not medicalized, in the sense that we use the term today, when physicians attended during the entire home-birth period.

Rather, physicians entered women's world around the birthing bed, and they learned how to act within a domain that was not their own. Some doctors learned it better than others, as they tried to create a place for themselves in women's domestic world. One physician realized that "obstetrical practice is an intimate intrusion into family affairs."[11] Some doctors fit right in. "Dr. Marsh stalked into the room," wrote one birthing woman, "like an easy old friend. In a few minutes he was playing with Louisa [a child] and talking to me about the new baby . . . He did what was expected of him, ate a bite of breakfast with Kate [her friend in attendance], then made himself so much at home, he put us all at ease. He took Louisa on his lap, and soon had her speaking pieces and singing. Then, as he waited longer, he began teaching her a new one."[12]

Dr. Daniel Cameron, who practiced medicine in Wisconsin in the 1850s, told of one of his obstetric calls: "Wednesday, a week ago, was called on to confine Mrs. Conklin . . . Sat up all night and talked scandal with some Cornish women in attendance."[13] Let us examine a little more closely this physician-patient interaction in the period before birth moved to the hospital, that is, in the 150-year period before the 1920s and 1930s.

The entrance of physician birth-attendants into the practice of obstetrics in America came during the 1750s and 1760s. Women called in physicians, such as William Shippen of Philadelphia, because they believed that doctors could provide services that midwives could not. In the eighteenth century this meant the use of opium or bleeding to relieve some of labor's discomforts, and forceps, to help along a protracted labor; by the middle of the nineteenth century this meant anesthesia to dull the pain of labor. The prospect of a difficult delivery, which all women fearfully anticipated, and the knowledge that physicians' remedies could provide relief and successful outcomes, led women to seek out practitioners whose obstetric armamentarium included drugs and instruments.

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11. William Allen Pusey, *A Doctor of the 1870s and 1880s* (Springfield, Ill.: Charles C. Thomas, 1932), p. 106.

12. Mabel Hobson Draper, *Through the Long Trail* (New York: Rinehart & Co., 1946), pp. 278–279.

13. Diary of Daniel Cameron, entry of 25 May 1853, p. 53, Wisconsin State Historical Society Archives.

How much physicians' interventions actually helped women have safer deliveries in the nineteenth century remains the subject of much debate among historians. I have addressed this question in more detail elsewhere.[14] For the purposes of this article, however, we should be aware that for most of the nineteenth century, physicians were taught to deliver without looking at women's genitals. As William Dewees, a famous obstetrician, wrote: "every attention should be paid to delicacy . . . the patient should not be exposed . . . even for the drawing off of the urine. . . . The operator must become familiar with the introduction of the instruments without the aid of sight."[15] This method of baby delivery, coupled with the fact that many physicians were trained through textbooks and not on live birthing women, and the fact that doctors frequently went directly from their infectious patients, with, for example, scarlet fever, to the birthing rooms of women they attended, meant that they sometimes, and perhaps often, caused some complications.

Throughout the nineteenth century, the decision of whether or not to employ the skills of a physician remained with women, where decisions concerning labor and delivery had been traditionally. The parturient, her midwife, and her assistants might have decided to call a doctor after labor had begun, and they then gave or withheld permission for each procedure suggested. Home birthing rooms usually contained the traditional female attendants right alongside the newer medical attendant, and these people all discussed and decided what procedures might be employed during the labor and delivery; the doctor merely added his voice to the others in the process. William Dewees, for example, after one successful forceps operation, was called to other cases because "the influence of this case upon many of the midwives of this city, procured me many opportunities of applying the forceps." In another instance, Dewees wanted to take blood from a laboring woman: "I represented to the friends of the patient, the danger of her case. . . . They agreed to the trial."[16] Although physicians had broken the gender barrier and birth was no longer exclusively a women's event, women, by making their own choices about attendants and procedure, continued to hold the power to shape events in the birthing room.

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14. Leavitt, *Brought to Bed.*

15. William P. Dewees, *A Compendious System of Midwifery, Chiefly Designed to Facilitate the Inquiries of Those Who May be Pursuing This Branch of Study* (Philadelphia: Carey & Lea, 1830), p. 295.

16. Ibid., 286n, 359.

Women retained considerable power in their own homes, and physicians bowed to it or risked losing patients and damaging their reputations among a whole community of women. Yet, as the new obstetrical techniques — from forceps to anesthesia — became available, they worked to the advantage of physicians, who held a monopoly over their use. Centuries of female traditions and the domestic environment in which these traditions operated, however, worked to the advantage of women. Both women and physicians had power over decision making; both had expertise about childbirth. Some physicians welcomed the knowledge of the birthing woman and her attendants. Chicago physician Morris Fishbein admitted that when he was a student in the second decade of the twentieth century, he "received better instruction" from a poor Irish woman whose eighth birth he attended than he ever had in any classroom. "She was thoroughly familiar with every step of the process."[17] Others found well-informed women intimidating. One physician recalled, "A young doctor, fresh from medical college, can pass many embarrassing moments in the presence of the neighborhood midwife."[18]

Very often, physicians and attending women got along very well together, and women learned many skills directly from physicians instead of only through the traditional route of learning from other women. One woman recalled her early twentieth-century experience:

> I remember the first new-born baby I ever washed and dressed. The doctor was blunt and rough speaking. He told me to get water and soap and the baby's belly-band and diaper ready. . . . I supposed that was all I had to do; to my surprise, he handed me the squalling, slick baby, and said, 'Here, take care of it.' I said, 'Oh, I have never done this — let some of the older women do it.' He said, 'No, this is your job. Just as well learn now, there's always a first time, you know.' Well, I washed the baby with it on my lap, face up. I said, 'Now, what will I do?' He said,'Turn it over and wash its back, then dress it.' 'Oh, no, I can't do that. I'm afraid I'll drop it, it is so slick,' I told him. He grabbed it by one arm and flipped it over, and said, 'You can't hurt 'em when they are newly hatched.' Well,

17. Morris Fishbein, *An Autobiography* (Garden City, N.Y.: Doubleday, 1969), p. 25.

18. Helen MacKnight Doyle, *A Child Went Forth: The Autobiography of Dr. Helen MacKnight Doyle* (New York: Gotham House, 1934), p. 322.

> I got the job done and was proud when the mother said I could name the little baby boy. I named him Carl.[19]

Whether they liked it or not, physicians found they had to accept that women would be present and active in home birthing rooms and that often they held the reins of power. As advisors, doctors had to learn that their word could be added to the other voices in the room, but that their views might or might not predominate. Sometimes considerable tension resulted from differences of opinion. A Long Island doctor in the 1890s, when public understanding of germ transmission was still new, tried to demand that his patient's helpers boil his instruments and make up a clean bed for the delivery. One woman told him: "No doctor I ever worked with had such foolish notions."[20] An Oklahoma physician explained why he could never try to shave a patient's pubic hair even though he thought it would help prevent infection. "In about three seconds after the doctor has made the first rake with his safety [razor], he will find himself on his back out in the yard with the imprint of a woman's bare foot emblazoned on his manly chest, the window sash around his neck and a revolving vision of all the stars in the fermament [sic] presented to him. Tell him not to try to shave 'em."[21] Similarly Dr. J. H. Guinn of Arkansas City, Kansas, wrote of the impossibility of achieving sterile conditions in urban or rural homes "in which there are five or six neighbor women, and, perhaps, the mother of the patient — all mothers of large families of children." The doctor could not, under such observation, "strip his patient and go at her with soap and scrub-brush, lather and razor."[22] Another practitioner realized that a doctor "has his living to make and cannot be too insistent with his patient over whom, usually, he has no control."[23]

By the latter part of the nineteenth century and the early twentieth century, physicians increasingly voiced their frustrations about the fact that they could not control events in the birthing rooms as much as they wanted. One reported a difficult presentation when he was stopped from doing a procedure he thought would be helpful: "Midwife persisted in interfering. . . . Midwife . . . and sisters ob-

19. Fay Noe, *All in a Lifetime* (Chicago: Adams Press, 1965), p. 79.

20. George S. King, *Doctor on a Bicycle* (New York: Rinehart 1958), pp. 61–63.

21. S. H. Landrum, "Letter to the Editor," *JAMA*, 1912, *58*:576. I would like to thank Carolyn Hackler for calling this letter to my attention.

22. J. H. Guinn to editor, ibid. (23 March 1912):880.

23. J. H. MacKay to editor, ibid. (9 March 1912):720.

jected to further assistance from us. Podalic version [turning the fetus in order to effect delivery] was again attempted but was forcibly interfered with by friends."[24] Another physician wrote: "The officiousness of nurses and friends very often thwarts the best-directed measure of the physician, by an overweening desire to make the patient 'comfortable' . . . all this should be strictly forbidden. Conversation should be prohibited the patient."[25] Physicians in home deliveries either persuaded the birthing women and the attending friends to agree to their medical suggestions or they went along with the women's demands; the alternative was to be removed from the cases. The overcrowding in the medical profession during the nineteenth century prompted physicians to find ways to modify their medical interventions and modulate their behavior to meet their patients' wishes.

The pressures some physicians felt in home birthing rooms did not abate as long as birth remained a home event. Dr. Samuel X. Radbill, who delivered babies in Philadelphia in the 1930s before limiting his practice to pediatrics, related to me working under the close observation of parturients' female friends and relatives. In one delivery he attended, the parturient's mother, who, after two days of labor, was extremely anxious for her daughter's welfare, "came rushing in in a rage, brandishing the [kitchen] knife and yelling, 'Doctor, if my daughter dies, I kill you!' " Radbill reported, with great relief, "[soon] the baby was safely delivered and everybody was as delirious with joy as they had been frantic with terror before."[26]

Under such conditions physicians had to keep a cool head and a steady hand. Radbill was relieved when a nearby hospital opened a maternity ward, and he could deliver his patients outside of their homes and away from the pressures of the woman's family. From such examples, it is clear that physicians did not have the kind of control they came to want in obstetric cases. Thus, birth was not medicalized during this home birth period; or, more precisely, it was medicalized only as much as women wanted it to be.

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24. Reported in James A. Harrar, *The Story of the Lying-In Hospital of the City of New York* (New York: Society of the Lying-In Hospital, 1938), p. 34.

25. Edward Henry Dixon, *Woman and Her Diseases from the Cradle to the Grave*, 10th edition, (New York: A. Ranney, 1857), p. 262.

26. Samuel X. Radbill to author, 24 June 1985, in response to "Author's Query for Birth Accounts," in the New York Times Book Review, July, 1983.

Women Lose Control

At the turn of the century women still exerted the controlling influence in the birthing room, but forces were building which ultimately led to women's loss of this power and to the assumption of medical authority over childbirth in the way we know it today. I have identified five factors that contributed to women losing control and physicians gaining it, and I will discuss the five in turn.

The first factor was a continuation of previous experience, and was not new in the early twentieth century. It was, in the words of nineteenth-century women, writing in their letters and diaries, the "shadow of maternity," a burden women carried through their reproductive years. The burden grew out of high fertility rates and the ever-present possibility of death or debility that women worried about as soon as they found themselves pregnant. A pregnant Clara Lenroot, for example, confided in her diary in 1891, "it occurs to me that possibly I may not live. . . . I wonder if I should die, and leave a little daughter behind me, they would name her Clara. I should like to have them." Three days later she again worried, "If I shouldn't live I wonder what they will do with the baby! I should want Mamma and Bertha [sister] to have the bringing up of it, but I should want Irvine [husband] to see it every day and love it so much, and I should want it taught to love him better than anyone else in the world."[27]

When her sister Emma experienced a difficult pregnancy in 1872, Ellen Regal went to be with her and found her "so patient and resigned." Ellen wrote to her brother, "it is not strange that she should tremble and shrink at the thought of that Valley of the Shadow of Death, which she must so soon enter."[28] Lizzie Cabot, in the middle of the nineteenth century, wrote to her sister when she was pregnant with her first child, "I have made my will and divided off all my little things and don't mean to leave undone what I ought to do if I can help it." Sarah Ripley Stearns, returning from church near the time of her confinement, wrote in her diary,

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27. Clara Clough Lenroot, *Journals and Diaries, Part I, 1891 to 1929*, edited by her daughter, Katharine F. Lenroot, typescript (May 1969) in family hands. My thanks to Katherine Vila, who shared copies of this diary with my class, "Women and Health in America," during the Spring semester, 1983.

28. Ellen Regal to Isaac Demmon, 13 May 1872, Regal Family Collection, Michigan Historical Collection, Bentley Historical Library, University of Michigan.

"perhaps this is the last time I shall be permitted to join with my earthly friends."[29]

Over and over again, the fears of death in childbirth were confirmed. As one New England woman wrote, "My friend, Mrs. John Howard, of Springfield, has died as she has expected to, under the most aggravated circumstances that a woman can leave the world. She never gave birth to her child; but died in the effort. In this dreadful manner have six of my youthful contemporaries departed this life."[30]

The shadow of maternity, repeated over and over again in women's lives, moved women to seek to improve and make safer their maternity experiences. It led women to seek medical expertise in their confinements, and in the period under consideration here, helped women appreciate the promise of the new medicine and anticipate improving their own condition by calling in the doctors. Thus it was an important factor in the process leading to the medicalization of childbirth.

A second prominent factor leading women to lose birthing room authority and helping physicians to gain it was bacteriology, the science of the study of microorganisms, many of which cause infectious diseases in humans. The beginnings of bacteriology are usually associated with the work of French chemist Louis Pasteur, whose investigations along with others from the 1860s to the 1880s led to the identification of specific microorganisms and an understanding of their role in causing infection and disease. In obstetrics, the practical application of these discoveries took the form of physicians trying to keep a clean birth environment and minimize the transmission of bacteria that could cause postpartum infection, the single most significant killer of birthing women. By the end of the nineteenth century, physicians routinely tried to use antiseptic techniques when attending childbearing women; because they could not always achieve the desired cleanliness, physicians increasingly argued that childbirth would be safer within the hospital where the sterile environment could be controlled.

The efforts for what physicians called "scrupulous cleanliness" were quite elaborate. The medical journals were filled with advice

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29. Lizzie Cabot and Sarah Ripley Stearns are quoted in Carl N. Degler, *At Odds: Women and the Family in America From the Revolution to the Present* (New York: Oxford University Press, 1980), p. 60.

30. Anne Lesley, in Susan Inches Lesley, *Recollections of My Mother* (Boston: Press of George H. Ellis, 1889), p. 306.

from one physician to another on how to achieve obstetric cleanliness. As one *JAMA* article instructed:

> The physician on his arrival should be careful to disinfect his hands before making a vaginal examination and this he can readily do by scrubbing his hands and arms in hot running water, preferably using tincture of green soap and scrubbing them for ten minutes with a fiber brush. The hands should next be immersed in alcohol; the nails being cleansed with a piece of sterilized gauze wet in the alcohol; they should next be immersed in an alcoholic solution of bichloride of mercury to the strength of 1 to 500, which solution should be rinsed from the hands by sterilized water before the lubricant is applied to them, which lubricant should be contained in a collapsible tube, or the physician after cleansing his hands may put on rubber gloves that have been boiled for at least half an hour and have then been soaked in a one per cent solution of lysol.[31]

But physicians found it hard to carry out such complicated regimens in patients' homes. One of them claimed from his own practice that it was especially foreign-born patients who seemed to particularly object to aseptic procedures:

> Elaborate preparations for asepsis are extremely alarming [to them]. They absolutely refuse to be handled by an obstetrician wearing rubber gloves. A sterile gown reminds them of an autopsy. Cleansing the field of operation makes them angry, as they feel it implies uncleanliness on their part. If the physician persists in his preparations, the chances are that he will be discharged, and another called who is not so exacting. Under such conditions, I have seen and had many cases where through no fault of mine, the asepsis was as bad as it could possibly be.[32]

In addition to this kind of reaction, physicians often found it difficult to keep themselves clean as they moved about the countryside or town from patient to patient. As one doctor noted, fingernails were a particular problem:

> Many physicians, especially in country practice, are obliged, to a considerable extent at least, to care for their own horses and to do more or less work about the garden. Such

31. Frederick Holme Wiggin, "Diagnosis, Prevention and Treatment of Puerperal Infection," *JAMA*, 1902, *38*:1006.

32. Lionel L. Albert, "Letter to the Editor," *Boston Medical and Surgical Journal*, 1916, *174*:701.

> men are very apt to have horny hands which in bad weather are quite liable to become more or less chapped and fissured. It is quite impossible to render such hands absolutely sterile. In such cases rubber gloves cannot be too highly recommended.[33]

But not all doctors saw the need for some of the extreme precautions advised in the pages of their journals, and many continued in their old ways.

Many physicians complained in this transition period that it was hard to persuade birthing women and their attending friends of the necessity for sterile environments. While it is no doubt true that some women did not understand why such extreme precautions had to be taken, others very quickly took up the language and promise of the new science and worked hard to help physicians and nurses in their efforts. Whatever their feelings about bacteriology and its impact on obstetric practice, women found that the new prescriptions were hard to follow in their own homes. Thus both physicians and birthing women understood that the hospital offered the kind of environmental control that would allow for routine sterile deliveries and lessen — potentially — the danger of infection. Thus one impact of the new medicine was to provide an impelling reason to centralize obstetrics practices within hospitals, where, as we shall see, women's voice became weaker.

One other effect of the expanding role of bacteriological thinking as it applied to childbirth was that women became somewhat distanced from the language and reasoning of the new methodology. Whereas previously women had retained control of obstetrical decision-making because of their extensive birthing room experience, bacteriology added a layer that was harder for the untrained to penetrate. Science was becoming something the experts did; laypeople might benefit from it, but they could not understand it all. As *Good Housekeeping* put it, "Slowly but surely childbirth is being lifted out of the realm of darkness into the spotlight of new science."[34] Medical scientists understood bacteriology and surgical procedures, but birthing women did not have access to the intricacies of the new science. Women seeking the newest that science had to offer came to accept the benefits of medicine without knowing how they worked. "See an obstetrician early," *Hygeia* urged its

33. J. F. Baldwin, "The Prevention of Pelvic Disease During and After Labor," *JAMA*, 1902, *38*:437–440.

34. Katherine Glover, "Making America Safe for Mothers," *Good Housekeeping*, 1926, *88*:270.

readers, "[h]e will take care of the rest."[35] The distancing of scientific knowledge and technical expertise from the general population in fact enhanced their appeal for millions of Americans, who eagerly awaited the promises of the new medicine. Birthing women wanted to believe that progress had finally come for them, and that childbirth would cease to be the most dangerous time for women.

If promises and hope pulled women toward medical institutions in the early twentieth century, an equally potent force pushed them away from their traditional confinements. The third factor in women's loss of control was the breakdown of the strong women's network that had existed through much of history. As America industrialized and urbanized, it became harder and harder for women to have at their beck and call a group of women who could offer the kinds of assistance they needed at the time of labor and delivery. The hospital thus beckoned the growing number of women who found their home births logistically hard to manage. Hallie Nelson's experiences in rural Nebraska emphasized some of the reasons women had begun to dread the ordeal of childbirth at home. Recalling when she was pregnant with her fifth child in 1936, Nelson wrote: "We had been at wit's ends to find a woman to take care of me and the baby and to help take care of the children." While she had been relatively successful in finding neighboring friends and relatives to attend her during her first four births, this time Hallie lamented, "The Clines had left the hills. . . . My sister Beulah was not available. . . . The other neighbors had children of their own to care for."[36]

The traditional woman-centered event in the home, called by historians "social childbirth," had been predicated on women being available when parturients needed them. With the increased mobility of the population and subsequent physical isolation from families and friends, women found it more and more difficult to find the help they needed. Helen Whiting of Winchester, Virginia, believed that "If there are other children, the mother cannot have the peace and rest she needs [at home.]"[37] Getting out of the home for confinements seemed the only way of coping with the stress that developed when a woman was ready to deliver her baby.

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35. Aldine R. Bird, "Progress of Obstetric Knowledge in America," *Hygeia*, 1933, *11*:439.

36. Hallie F. Nelson, *South of the Cottonwood Trees* (Broken Bow, Nebraska: Purcellow, 1977), p. 214.

37. Quoted in "I Had A Baby Too: A Symposium" *Atlantic*, 1939, *163*:764.

A fourth factor, the use of new technology, encouraged increased medicalization of childbirth in the early twentieth century. Throughout American childbirth history, two trends have been evident: one, women's awareness of the dangers of childbirth for their own lives and postpartum health, and, two, the attempts to improve the level of safety for both mother and child through the use of new drugs, new instruments, and the application of new technology. We have seen how bleeding techniques and opium derivatives were used in the colonial period to help women through their trials, and how in the nineteenth century anesthesia use increased to alleviate the pain of labor. Throughout both centuries the forceps were modified and improved innumerable times. Yet, not until the twentieth century did the use of such innovations begin to work in the direction of increasing medical authority over childbirth.

The relationship between new technology and growing medical authority can best be seen through an examination of cases of difficult delivery, for example, cases of cephalopelvic disproportion, in which a woman's pelvis is not adequate to allow the passage of the fetal head. These traditionally were cases — more common in the past because of the prevalence of rickets, a vitamin D deficiency resulting in abnormal or weak bone growth — in which physicians would be called to perform a craniotomy. By puncturing the fetal cranium and removing its contents, physicians reduced head size, facilitating delivery and saving the mother's life. In the nineteenth century, physicians often tried to intervene with forceps and other implements to allow a live delivery. But by the end of the century, a series of improvements on the cesarean section and new surgical procedures like the symphysiotomy or pubiotomy — procedures in which pelvis size was increased through the separation of the pubic bone — seemed realistically to allow both mother and child to survive in problematic deliveries. It was this potential that allowed physicians to transform their participation in such cases into a new, more active, and authority-wielding role in the birthing room.

When craniotomy had been the only choice to save the suffering woman, the decision to do it was one made by the traditional birth attendants, no matter how reluctantly. Yet, as the technical choices expanded, and the differences among them rested on more subtle distinctions in reading the pelvimeter or in judging pelvic size and fetal head size through external palpations (thus becoming less clear to persons with no medical training), physicians perforce played a greater role in determining events. Interestingly, in those cases in

which women's lives clearly rested in the balance, husbands became more involved in the decision making, conferring with the medical attendants about possible courses of action. Sometimes, perhaps often, the woman herself was not consulted at all. Dr. Edward P. Davis of Philadelphia, for example, reported a case of a breech presentation in a woman he attended in 1902 in which he expected a difficult delivery. "The patient's husband was warned of the complications existing and the dangers of the case fully stated . . . The husband was informed that he was at liberty to have consultation either before or during labor." Davis wanted to perform a cesarean section. "Section was proposed to the husband and immediately accepted," the physician noted, giving credit for the success to the parturient's husband: "Fortunately the husband appreciated the situation and by his prompt and efficient help made a successful termination of the case possible."[38] In the discussion of this case, the birthing woman herself was not mentioned, except as the person upon whom the procedures were to be performed! This is in striking contrast to usual confinement descriptions of the period, which still focused on the birthing woman herself.

The physicians' experience with taking additional authority during difficult cephalopelvic disproportion cases made it easier for them to assert authority during normal deliveries. It made the physician bolder in claiming the right to make medical decisions during the height of labor. "The time will come," exclaimed a Chicago physician, "when under certain circumstances — ex. gr. [e.g.] in hospital practice — the woman shall not be permitted to elect as freely as she must be allowed to do at present."[39]

Wrote Dr. Samuel C. Busey of Washington, D. C., "We must strike directly at the root of the evil, which declares that 'it is the mother's right to save her life, even at the sacrifice of her child.' We must in the interest of a broader humanity and a far wider field of usefulness, accept the progress of science, and offer chances to two lives rather than take the one which cannot assure the safety of the other."[40] The medical profession learned to emphasize the scientific,

38. Edward P. Davis, "Six Cesarean Sections," *American Journal of Obstetrics and Diseases of Women and Children*, 1902, *45*:177–178. For an expanded analysis of this issue, see my "The Growth of Medical Authority: Technology and Morals in Turn-of-the-Century Obstetrics," *Medical Anthropology Quarterly*, 1987, *1*:230–255.

39. W. W. Jaggard, "Conservative Caesarean Section," *JAMA*, 1888, *11*:98.

40. Samuel C. Busey, "The Wrong of Craniotomy upon the Living Fetus," *American Journal of Obstetrics and Diseases of Women and Children*, 1889, *22*:53.

the medical, the technological, and to pull patients away from their traditional supports and root them more deeply in the world of medicine. Dr. George McKelway discussed the importance of gaining medical control:

> It would seem hardly necessary for me to emphasize the fact that the obstetrician alone must be the judge of what is to be done. The preference of the ignorant or prejudiced parents or of the friends, the disposition on their part to save the life of one being from any added risk at the expense of the other being, or any sentimental considerations on their part of any nature, for or against either life at the expense of the other, should not weigh at all in the obstetrician's mind or decide his course. The responsibility is his for his conduct in the case, and he cannot answer to his own conscience if he does that which he believes to be inadvisable or wrong, simply because someone else prefers that he should.[41]

Obstetricians, for the first time in their history, tried to take command on their own terms rather than respond to the problems others defined.

When physicians began defining their own terms for decision making — informing and getting consent from the woman or her family, but decreasingly responding to the woman's own point of view — they saw the parturient as the antagonist to the fetus. It was her life, or health, versus the life of the fetus. She could not be objective in such decisions; therefore she should be excluded from them. "Such a right [of decision making] cannot, however, be conceded to a woman in labor who is responsible for the existence of her child and the danger of both," wrote Busey, "since by it she imposes upon an innocent operator the act of killing, that her prospect of life may be slightly improved."[42] It was in the definition of the problem, thus, that a hierarchy began to evolve with medicine at the top and the previously dominant partner of birthing women deposed to a distinctly less powerful position.

Physicians were increasingly successful at creating this hierarchical situation, specifically because of the dilemmas posed by life-threatening situations such as those arising from cephalopelvic disproportion and the nature of the options available in this period. The new technology making it possible to consider fetal life as a

41. George I. McKelway, "Delivery through the Abdominal Walls vs. Craniotomy in Otherwise Impossible Births," *JAMA*, 1892, *19*:8.

42. Busey, "The Wrong of Craniotomy," p. 67.

viable option provided physicians with the ability to wrest decision making power away from its traditional place within the family and to establish it in their own domain. It was in the high-risk cases requiring surgical interventions that physicians found their first true voice in the birthing room; they later learned to use the new authority in all birthing rooms, especially as childbirth moved out of women's homes and into medical institutions.

The fifth factor that led to increased medicalization of childbirth in the early twentieth century was the hospital itself, the institution and what it came to stand for, and the public monies that became available to help some women pay for their hospital stays. We have already seen the attraction the hospital had for physicians trying to maintain a sterile environment and for the women who supported their efforts. We have also seen that the hospital became more attractive to women as their homes seemed less able to accommodate childbirth disruptions. The "hospital is equipped with every modern device for the safe delivery of babies," wrote one mother, "nursing and medical attention is available at any hour of the day or night. How much simpler — and more restful — to be in the hospital where babies are an accepted business."[43] Another woman found, "My stay in that hospital was like a lovely vacation."[44] Most important, the hospital came to symbolize what the new medicine had to offer. Whether or not the new medicine yet delivered on its promises (which, in the case of obstetrics, it arguably did not), women traded on the promises and hoped against hope that the miracles of medicine would help them through a difficult time.

Perhaps even more significant was the federal government's new willingness and ability to pay for medically aided maternity care. Arguing that childbirth was women's battleground in the same way as the Great War had been men's, advocates of the proposed Sheppard-Towner Act argued in 1921, "During the nineteen months we were at war, for every soldier who died as a result of wounds, one mother in the United States went down into the valley of the shadow and did not return."[45] Whether or not the statistics were

43. Unnamed woman quoted in M. F. Ashley Montagu, "Babies Should be Born at Home!" *Ladies' Home Journal,* 1955, *72*:52–53.

44. Gladys Denny Shultz, "Journal Mothers Report on Cruelty in Maternity Wards," *Ladies' Home Journal,* 1958, *75*:44.

45. S. Josephine Baker, "Why Do Our Mothers and Babies Die?" *Ladies' Home Journal,* 1923, *40*:212–213.

correct, the argument was powerful. When it passed, the act, which was in effect until 1929, provided federal funds for maternal and child health, and some of these were used to allow women who otherwise could not afford hospital care to go into the institutions for their deliveries. And more wide-ranging, the 1935 Social Security Act provided federal money for maternal and child health projects, which served to increase the medical attention received by pregnant and childbearing women.

It was the confluence of these five factors that I believe led to the medicalization of American childbirth in the twentieth century. Each one alone would not have led to such significant change as occurred. The significance of these changes cannot be over-estimated. For a millennia women had controlled childbirth practices; they had determined their own experiences. But in a relatively short amount of time in the twentieth century, women willingly gave up what they had had in exchange, they thought, for something even better: safety and security to survive the dangerous experience of childbirth. Women relinquished their own collective decision making, the traditional ways of helping one another deliver their babies, and participated actively in transferring their own authority to the medical experts, to those they hoped would save them from the dangers that had plagued childbirth throughout history.

What women found once they got to the hospitals is entirely another story, one that many today are personally acquainted with. The bargain was not quite as women had anticipated. First, the hospitals in the period in which women made the move were not as safe as they had promised to be; maternal mortality did not drop as a result of the move to the hospital. It was not until the development and use of antibiotic drugs following the Second World War that postpartum infection rates fell significantly. Second, women found that they had given up more than they had expected by moving from home to hospital. "The cruelest part of [hospital] childbirth is being alone among strangers," wrote one woman.[46] In short, women soon realized that the physical move from their own homes to the physicians' institution shifted the balance of power. Birth was no longer part of the woman's domain, as it had been throughout history. It became, instead, a medical affair run by medical professionals. Women were no longer the main actors; instead, physicians acted upon women's bodies. Women who were

46. Quoted in Shultz, "Journal Mothers Report," p. 44.

attended by physicians in their own homes could still determine what would happen; they continued to have the power to refuse to be shaved or to demand ether. They still controlled much of the birthing process. But women who entered the birthing rooms of medicine were captured by the routine and by the expertise surrounding them. They could not decide the specific events of their own confinements. Women who went to the hospital missed the companionship that had been theirs at home, and early-on felt alienated from the hospital environment. Perhaps they could not have predicted ahead of time that the domestic comforts would not be replicated in the hospital, but they certainly missed them when they were gone. Upon entering the hospital women found that hospital routine put them on an assembly line and took away their individuality.

All of a sudden the familiar supports disappeared, and in their place, little comfort, only the bustle of starched skirts, the thermometer poked in the mouth at odd hours, and the whispers of strange people speaking among themselves. One woman remembered her 1935 confinement as a "nightmare of impersonality," during which she felt "helpless" and "like a pawn in a strange game." Others remembered being "all alone," "abandoned," and "lonely . . . knowing no one." Hospitals seemed unable to provide a supportive atmosphere for women in labor; perhaps more significant, hospital staffs did not notice that such an environment was needed or desired by their maternity patients. Women felt too intimidated by institutionalized medicine to make their feelings known; doctors and nurses did not show a personal empathy for women's ordeals; and routines and schedules did not encourage providing the comforts of home. One woman found her hospital experience so traumatic, that, she wrote, "Months later I would scream out loud and wake up remembering that lonely labor room and just feeling no one cared what happened to me, no one kind reassuring word was spoken by nurse or doctor. I was treated as if I was an inanimate object."[47] Birth in the hospital for many American women in the 1930s was no blessing at all. It was still dangerous, perhaps more dangerous than being at home, and it was psychologically alienating.

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47. Quotations are from personal communications to the author in response to a *New York Times Book Review* "Author's Query," of July, 1983. About two hundred responses were received. Quotes here from Katherine S. Egan, 25 August 1983; Marilyn Clohessy, 9 September 1983; Elsa Rosenberg, 30 July 1983; and from women who wished to remain anonymous. My thanks to all of them.

For most of history, birthing women, accompanied by their women friends and relations, had controlled the birth environment and had felt comfortable in it because it was part of their own domestic world. The medical institutionalization of birth in the twentieth century took away parts of the birth experience that had been traditionally under women's control, leaving women vulnerable and alone. The move to the hospital thus emerges, in my analysis, as the single most important transition in childbirth history. More than the entrance of male physicians, and more than their medical and surgical interventions, the location of childbirth uncompromisingly and directly altered women's birth experiences, replacing the traditional female-centered domestic childbirth with a physician-directed medical and surgical event. Women realized that in the earlier period, with either midwife or physician attendants, they had been "brought to bed" by their friends while by the middle of the twentieth century they were "alone among strangers" in an alien hospital environment. The result of the medicalization of childbirth is the subject of much analysis today, as hospital staffs and birthing women again are engaged in trying to improve the experience that so many of us share. The context of today's struggles is the history I have just described, and women's efforts are in large part dedicated to recovering some part of their past, when, even while incorporating medical gains and expertise, childbirth belonged to women.

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Polio Vaccine Trials of 1935

LAWRENCE B. BERK

Poliomyelitis, once the summertime bane of children, is now a disease virtually limited to medical textbooks. Poliomyelitis has only arisen as a prominent disease during this century, with the first known epidemic of polio in Sweden in 1887, and the first United States epidemic 10 years later in Vermont. Beginning in the first decade of this century the full force of the American medical-scientific effort became focused on polio. As early as 1935 there was a dress rehearsal of the ultimate triumphs over polio achieved later by the vaccines of Jonas Salk and Albert Sabin. That year, large-scale human polio immunization trials of a live virus vaccine and of a formaldehyde-treated killed virus vaccine took place across the United States. The outcome of these tests shaped the direction of polio research for the next 20 years.[1]

A Brief History of Poliomyelitis

The first appearance of poliomyelitis, also called Heine-Medin Disease and infantile paralysis in the early literature, is subject to debate. There are many who believe that an Egyptian stele of the eighteenth dynasty (1580–1350 B.C.) shows a priest suffering from a polio-induced deformity of his right leg. This is conjecture, of course, and no authoritative description of a polio-like illness has been discovered prior to the end of the eighteenth century. The first generally accepted description of polio was made in 1793 by Michael Underwood, in the second edition of his textbook, *A Treatise on the Diseases of Children.*[2] Underwood described a disease in which young infants suffered an acute onset of uniplegia which variably resolved over time. Other isolated descriptions of what may have been polio were made over the next 50 years. One descrip-

1. For descriptions of early American polio research see: John R. Paul, *A History of Poliomyelitis* (New Haven: Yale University Press, 1971); Saul Benison, "Speculation and Experimentation in Early Poliomyelitis Research," *Clio Medica*, 1975, *10*(1):1–22; Saul Benison, "Poliomyelitis and the Rockefeller Institute: Social Effects and Institutional Response," *J. of History of Medicine*, 1974, *29*:74–92; Saul Benison, "The History of Polio Research in the United States," in G. Holton, ed., *The Twentieth-Century Sciences* (New York: Norton, 1972).

2. Michael Underwood, "Debility of the Lower Extremities," in *A Treatise on the Diseases of Children, vol. 2*, 2nd ed. (London: J. Mathews, 1789).

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tion in particular, made in 1829 by Giovanni Monteggia, an Italian surgeon, is almost certainly a description of polio:

> In this connection I shall mention a special kind of paralysis, limited to either of the legs, which I have several times seen in my practice but which is not yet found in books. It affects sucklings or children not much older; they begin by suffering a fever for two or three days, then it is discovered that one of their legs is rendered immobile, flaccid, weak, paralytic, save when certain ones exhibit a slight movement when the sole of the foot is tickled. The fever soon goes away and the child feels well; but the member remains motionless and as time goes on regains only an imperfect degree of strength, and to such an extent that I know persons who are now adults who still drag one weak leg because they were not treated in time.[3]

This description was soon followed by the reports of John Badham, in England, of a polio-like illness attacking four children in a small community during the summer of 1835.[4] These reports in turn stimulated the pioneering work of Jacob Heine of Germany in 1840.[5] He systematically characterized the symptoms of polio and first suggested that the disease was due to an affliction of the spinal cord. Hundreds of other cases were then described in the literature over the next 50 years.

Oskar Medin described the first known epidemic of poliomyelitis, which occurred in Stockholm in the summer of 1887.[6] He had seen one or two cases in Stockholm yearly for the previous 15 years. That summer he saw 44 cases. Medin was the first to have an opportunity to study many cases at once. He concluded that polio was an acute infectious disease that caused destruction of the gray anterior horns of the spinal cord, and is initially a systemic disease. He also distinguished the spinal, bulbar, and encephalitic forms of the disease.

Elucidation of the micropathology of polio began in 1853 with the work of Victor Cornil,[7] and was brought into the modern age by Ivar Wickman, whose definitive micropathological studies began

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3. Giovani Batista Monteggia, *Instituzione Chirurgicale*, 2nd ed., (Milano: Presso Giuseppe Maspero, 1813).

4. John Badham, "Paralyse Chez le Enfants," *Gaz. Med. de Paris*, 1835, p. 825.

5. Jacob Heine, *Beobachtungen über Lahmungzustande der Unteren Extremitaten und Deren Behandeln* (Stuttgart: F. H. Kohler, 1840).

6. Oskar Medin, "En Epidemi af Infantil Paralysi," *Hygeia*, 1890, *52*:657.

7. Victor Cornil, "Paralysie Infantile," *Compt. Rend Soc. de Biol.*, 1863, *5*:187.

in 1905.[8] Wickman presented a complete pathological picture and proposed that the disease is acquired through the alimentary tract. Wickman's work was followed in 1908 by Karl Landsteiner and Erwin Poppler's transmission of polio to monkeys,[9] and later, in 1909, the identification of the infectious agent as a "filterable virus" by Landsteiner and Constantin Levaditi.[10] That same year Simon Flexner and Paul Lewis demonstrated the monkey-to-monkey transmission of polio.[11] These studies mark the beginning of the modern era of polio research.

Polio Pathophysiology

The name "poliomyelitis" is derived from the Greek and means inflammation of the gray marrow. It is a disease in which a small RNA virus selectively infects and kills those cells in the anterior horn of the spinal cord that innervate the muscles. The disease can attack the neurons of a single limb, often a leg. It can occur higher in the spinal cord and cause a paralysis of the respiratory muscles, necessitating artificial respiration until the use of these muscles returns. The virus can also attack the brainstem, causing facial paralysis or loss of respiratory drive. The disease occurs in forms subclinical to fatal, with the vast majority being the former.

Early polio research focused on the disease as two distinct entities, experimental and human. Experimental polio was induced artificially in Macacus rhesus monkeys by direct intracerebral inoculation of a homogenate, a finely ground preparation made from the spinal cord of a human polio victim or an infected monkey. While they induced identical pathological lesions in the spinal cord, the similarity of human and experimental polio remained unclear. Much more was known about the monkey disease than was known about the human disease.

Rhesus monkeys in the wild do not suffer from polio or have antibodies to the disease. However, polio can be induced consistently in monkeys either by direct inoculation intra-cerebrally or by

8. Ivar Wickman, *Acute Poliomyelitis, Nervous and Mental Diseases* (Monograph Series, No. 16, 1913).

9. Karl Landsteiner and Erwin Poppler, "Uebertragung der Poliomyelitis Acuta auf Affen," *Ztschr. f. Immunitats. Orig.*, 1909, *2*:377.

10. Karl Landsteiner and Constantin Levaditi, "La Transmission de la Paralysie Infantile aux Singes," *Comp. Rend. Acad. de Sci.*, 1909, *149*:1014.

11. Simon Flexner and Paul A. Lewis, "The Transmission of Acute Poliomyelitis to Monkeys," *JAMA*, 1909, *53*:1913.

rubbing the virus into the nasopharynx. Early researchers generally accepted that from the nasopharynx the virus entered the central nervous system through the olfactory nerve and then travelled along the gray matter down to the anterior horns of the spinal cord. Maurice Brodie did a series of experiments on monkeys, preventing the development of polio by cutting the olfactory nerves and preventing the development of the pathological lesions of polio by cutting the spinal cord.[12]

Most of the scientific community believed, but could not prove, that the virus entered humans by the same olfactory path. The gastrointestinal tract served as the alternative portal of entry (originally hypothesized by Wickman). Indirect proof for the olfactory thesis consisted of two parts. If the gastrointestinal tract was the portal, then it was assumed that the blood stream would be responsible for transport of the virus to the brain. But in the great majority of studies on humans showing early signs of polio, no virus had been found in the blood. Second, a reproducible virus could be found in human nasal secretions but only rarely in the feces. Subsequent research proved that polio is a gastrointestinally acquired disease, but in the meantime, the primacy of the olfactory thesis led to several decades of research on using nasal sprays as prophylaxis against the virus.

Polio Epidemiology

Polio is remembered as being one of the scourges of the first half of the twentieth century. Every summer, parents lived in fear of their children being afflicted with polio. Although their fear was real, the reality was less dramatic.[13] The incidence of polio was approximately one three hundredth to one one thousandth over the course of a lifetime; 10 percent to 50 percent of all cases died and 25 percent to 45 percent of those who survived had permanent paralysis. In fact, Sidney D. Kramer in 1938 noted that

> [p]oliomyelitis is a relatively rare disease and except in communities where it is more or less endemic it is the privilege

12. Maurice Brodie and Arthur R. Elvidge, "The Portal of Entry and the Transmission of Poliomyelitis," *Science*, 1934, 79:235.

13. Howard J. Shaughnessy, "Epidemiology of Poliomyelitis," in Philip Lewin, ed., *Infantile Paralysis* (Philadelphia: W. B. Saunders, 1941), p.29.

> of few physicians to observe a sufficient number of instances of the disease to give them any great familiarity with it.[14]

The tests to determine human exposure and immunity to poliovirus were crude and very expensive. They required mixing a volume of human serum with a volume of infected monkey brain emulsion and injecting it into the brain of an uninfected monkey. If the monkey developed the pathologic lesions of polio, then the human serum contained insufficient polio antibodies and the person was considered seronegative and possibly at risk for contracting polio. Although researchers knew that polio reinfection in humans was extremely rare — only fourteen reported cases occurred between 1914 and 1934[15] — only 75 percent of adults tested after infection had antibodies as determined by this technique.[16] To explain this puzzling finding, investigators postulated that there were two types of immunity: humoral and tissue. Humoral immunity, the immunity found in the serum, was due to circulating antibodies. The basis of tissue immunity was unknown; it might result from exposure to the virus or develop naturally as the body aged. The test for tissue immunity of a monkey was the survival of the monkey after the direct inoculation of the virus into its brain. There was no test for the presence of human tissue immunity.

Before 1940 researchers made only limited determination of the humoral immunity status of humans. Their studies varied significantly, but they agreed that children over one year of age were almost uniformly susceptible, that the rate of humoral immunity rose slowly with age, and that approximately one quarter of adults showed no humoral immunity.[17] No one understood why the full symptomatology of polio developed in certain people while the vast majority had only subclinical infections. It was generally accepted that it was impossible to predict which children were susceptible to paralytic infection and, given that few of them appeared to have protective antibodies, that there was sufficient risk of major morbidity to justify the search for a vaccine. Although there were numerous early attempts at vaccines for monkeys, there were no human trials

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14. Sidney D. Kramer, "An Evaluation of a Number of Procedures Recommended for the Prevention of Poliomyelitis," *The Mississippi Doctor,* 1938, *16*:1.

15. Thomas B. Quigley, "Second Attack of Poliomyelitis," *JAMA,* 1934, *102*:752.

16. John A. Kolmer, "Susceptibility and Immunity in Relation to Vaccination in Acute Anterior Poliomyelitis," *JAMA,* 1935, *105*:1956.

17. Ibid.

until the 1930s, when the Kolmer and Brodie vaccines were developed and widely tested.

The Kolmer Vaccine

John Albert Kolmer was already an established physician and scientist when he began his polio research. He was born in Lanconing, Maryland, in 1886 and graduated from the University of Pennsylvania School of Medicine in 1908 with the Packard Prize in Clinical Medicine. He became a pathologist at the Philadelphia Hospital for Contagious Diseases, and while there earned a doctorate of public health from the University of Pennsylvania, awarded in 1914. By 1919 Kolmer was Professor of Pathology and Bacteriology at the University of Pennsylvania Graduate School of Medicine. In 1930 he joined the faculty of Temple University School of Medicine, first as Professor of Chemotherapy and then as Professor of Medicine in charge of Bacteriology and Immunology.

Before World War I, he and Dr. George Raiziss were the first American scientists to manufacture and test salvarsan, the first antisyphilis drug. During World War I his laboratory manufactured this drug for the United States Army, which led to the development of the Institute for Cutaneous Medicine, which he headed until his retirement in 1957. Kolmer gained renown for a widely used serum syphilis test, and won several awards for his work. He published his first paper on a polio vaccine in 1934, and in June, 1935, Kolmer received the Ward Burdick Medal by the American Society of Clinical Pathologists for his work on polio vaccines.[18]

Kolmer began his polio vaccine research with the belief, based on the work already in the literature, that only a live virus would be useful as an immunizing agent. He searched for a less virulent live virus, believing, in his words,

> . . . [s]o far no method has been discovered for modifying the infectivity of living virus to render it entirely safe for the vaccination of human beings analogous to vaccination against smallpox with the living virus of cowpox. Whether or not the virus of repeated monkey passage is infective for human beings has not been determined but the possibility of permanent loss of infectivity of the virus for man as a result of passage through

18. Louis Tuft, "Memoir of John Albert Kolmer, 1886–1962," *Transactions & Studies of the College of Physicians of Philadelphia*, 1964–1965, Fourth Series, 32:49.

> a lower animal analogous to the change in smallpox virus by passage through calves (cowpox virus) remains the most hopeful possibility in active immunization against poliomyelitis.[19]

Kolmer believed in the decreased virulence of monkey virus for humans because researchers had found that polio-infected human spinal cord emulsion was not consistently infectious for monkeys, but became more infectious after several transmissions (passages) from monkey brain to monkey. Further, monkeys immune to passage virus could be infected by human virus, and therefore the passage virus was considered immunologically modified and less virulent (the researchers were not yet aware there is more than one strain of human virus).[20]

Having only monkeys to use as test animals, Kolmer could not prove that a monkey-specific virus was less virulent for humans. Thus his research with monkey-passage virus had to be confirmed by human testing. To make such testing safe, he needed chemically to attenuate the virus so it would be immunogenic but not infectious for monkeys. That the chemically modified virus would also be passage-modified would, he believed, make the virus that much safer for human testing. In September of 1933 he submitted a paper to the *Journal of Immunology* in which he evaluated several compounds as modifiers and chose sodium ricinoleate, the salt of the main fatty acid in cod liver oil. He found that subcutaneous or intracutaneous injection of the proper amount of attenuated virus rendered most monkeys resistant to intracerebral inoculation with polio virus. In contrast, chloroform or heat-treated virus did not render the monkeys resistant.[21] After his initial testing on three monkeys, of which two developed polio symptoms after intracerebral inoculation, he tested the virus on another 17 monkeys, of which only two more developed polio after intracerebral inoculation. The untreated control animals universally developed polio after intracerebral inoculation. No antibody testing was performed.

Based on these findings, Kolmer felt confident enough to test the vaccine on himself and his assistant, both of whom were sero-

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19. John A. Kolmer and Anna M. Rule, "Concerning Vaccination of Monkeys Against Acute Anterior Poliomyelitis With Special Reference to Oral Immunization," *Journal of Immunology,* 1934, 27:505.

20. Kolmer, "Susceptibility and Immunity," p. 1956.

21. Kolmer and Rule, "Concerning Vaccination of Monkeys," p. 505.

negative before the test and converted afterwards.[22] Armed with these positive results he proceeded in late 1934 to vaccinate 25 children, including his own two sons, "all at the request or with the written consent of the parents."[23] Twenty-one of 25 children had an increase in serum neutralizing power one week after vaccination.

Kolmer continued to test his vaccine on children, and in April of 1935 was able to state that he had tested the vaccine on over one hundred children without ill effect.[24] In November of 1935 he presented results on 446 people, including 319 children, who had been vaccinated by him with his vaccine.[25] In addition, he reported that the Research Institute for Cutaneous Medicine had distributed 13,112 cc of vaccine to 582 physicians in 32 states and Canada, and that a commercial manufacturer (the holder of the patent on using sodium ricinoleate), the Merrell Company of Cincinnati, had distributed another 8,910 cc of vaccine to 137 physicians. This amount was enough, together, for 12,000 immunizations. As was not unusual in this time, Kolmer did not describe any monitoring of this vaccination program or give any instructions to physicians on proper techniques for administering the vaccine and reporting side effects. Kolmer dedicated much of one article to explaining nine reported cases of polio after inoculation with his vaccine.[26] He attempted to show that these cases were neither directly due to the vaccine nor due to failure of the vaccine properly to immunize the subjects. He addressed each reported case of polio in turn and to his apparent satisfaction rejected any culpability.

It was over a year before Kolmer published another article on his vaccine, at which time he stated that:

> From April to September, 1935, 10,725 individuals in 36 different states were given the vaccine by subcutaneous injection 3307 or 30.8 per cent of whom were children under 4 years of age, 7425 or 60 per cent were from 4 to 15 years and 993 or 0.2 per cent (sic) being over 15 years of age. No individual who received the full three doses developed poliomyelitis,

22. John A. Kolmer, "A Successful Method for Vaccination Against Acute Anterior Poliomyelitis," *American Journal of Medical Science,* 1934, *188*:510.

23. John A. Kolmer, Gorge F. Klugh, Jr., Anna M. Rule, "A Successful Method for Vaccination Against Acute Anterior Poliomyelitis," *JAMA,* 1935, *104*:456.

24. John A. Kolmer, "Immunity and Vaccination in Infantile Paralysis," *American Journal of Nursing,* 1935, *35*:311.

25. John A. Kolmer, "Vaccination Against Acute Anterior Poliomyelitis," *American Journal of Public Health,* 1936, *26*:126.

26. Ibid.

but among the 10,725 inoculated individuals there were 9 cases of poliomyelitis following one or 2 doses in children from 21 months to 10 years of age.[27]

The Brodie Vaccine

At the same time that Kolmer was working on his vaccine, a Canadian physician, Maurice Brodie, was developing another vaccine. Brodie was born in 1903 in Liverpool, England, and was raised in Ottawa. He was educated at McGill University where he received his M.D. in 1928. In 1932, after beginning his studies of poliomyelitis in Canada, he became an Associate Professor of Bacteriology and Immunology at New York University and was placed in charge of poliomyelitis research at the New York Department of Health's Bureau of Laboratories.[28] Dr. William H. Park was the director of the Laboratories and himself a renowned expert on poliomyelitis.

Brodie's initial work in Canada and New York was on the immunity developed in monkeys by live virus vaccination and by inoculation of mixtures of antibodies and virus.[29] He showed that subcutaneous or intracutaneous injections of virus-antisera mixtures usually produced humoral and tissue immunities in monkeys, but that the risk of inducing polio by these injections outweighed their usefulness as immunizing methods. Searching for a safer method of inducing immunity, Brodie experimented with a killed-virus vaccine. His preliminary work on such a vaccine, which was published in June, 1934, compared various methods of killing the virus, including phenol (carbolic acid), aqueous formaldehyde (formalin), and heat.[30] He found heat and phenol did not give immunogenic products. However, Brodie could reliably induce antibodies in monkeys by subcutaneously or intracutaneously injecting formalin-treated vaccine. He initially tested his vaccine on three monkeys. All three developed humoral immunity (antibodies) but only one developed tissue immunity (survival after direct intracerebral inoculation). Encouraged by these results, Brodie successfully tested his

27. John A. Kolmer, "Active Immunization Against Acute Anterior Poliomyelitis With Ricinoleated Vaccine," *Journal of Immunology,* 1937, *32*:341.

28. Harold B. Rothbart, "In Memorium: Maurice Brodie, M.D., 1903–1939," *Detroit Medical News,* 1939, *30*(40):9.

29. Maurice Brodie, "Fall of Infectivity and Immunizing Power of Poliomyelitis Tissues at Intervals After Complete Paralysis," *Proceedings of the Society of Experimental Biology and Medicine,* 1933, *30*:1238.

30. Maurice Brodie, "Active Immunization in Monkeys Against Poliomyelitis With Germicidally Inactivated Virus," *Science,* 1934, *79*:594.

vaccine on another 26 monkeys.[31] Comparing the amount of virus needed to neutralize the sera versus the amount of virus needed to induce death by intracerebral inoculation, he concluded that live virus gave more humoral immunity than tissue immunity, whereas the killed virus gave more tissue immunity than humoral.

Brodie then proceeded to test the vaccine on humans, and presented the first results in September of 1934. Brodie's original volunteers were himself and six employees of the Bureau of Laboratories. None of these test subjects developed a severe reaction to the vaccine. In November, he presented the results from immunizing 12 children between the ages of one and six years who had been volunteered by their parents. Measures of their antibody levels before and after immunization showed that all 12 developed increased antibody titers.[32]

At this point, Brodie faced a dilemma: although the monkeys had all developed humoral immunity, not all had developed tissue immunity. At that time, researchers believed that tissue immunity was the more important immunity, because of the lack of humoral immunity in a quarter of post-polio convalescents. Brodie reasoned as follows:

> Of course we have no index as to the level of immunity required to protect the children against natural infection nor whether the obtained is sufficient. The tissue immunity in children cannot be tested, but as the monkeys treated with formalized virus show a relatively high tissue immunity, sufficient in most cases to withstand intracerebral inoculations of virus, it is quite likely that the children have appreciable tissue immunity. By analogy with louping-ill, a disease of sheep quite analogous to poliomyelitis, it should be ample to protect against natural exposure to the virus, for formalized louping-ill virus was unable to protect sheep against intra-cerebral infection, yet did against the natural disease.[33]

Brodie felt confident enough to expand his testing. He knew that the vaccine caused no immediate problems and, based on serum neutralization tests in 12 children, generated antibodies, but he

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31. Maurice Brodie, "Active Immunization in Monkeys Against Poliomyelitis With Germicidally Inactivated Virus," *Journal of Immunology,* 1935, *28*:1.

32. Maurice Brodie, "Active Immunization of Children Against Poliomyelitis With Formalin Inactivated Virus Suspension," *Proceedings of the Society of Experimental Biology and Medicine,* 1934, *32*:300.

33. Ibid.

had no idea of its real efficacy. He continued testing on children, comparing the efficacy of various dosages and dosing regimens. After a total of 69 human vaccinations over a period of approximately six months, he began a large-scale vaccination program involving 1,600 children in Kern County, California, and published the results in August 1935.[34] None of the immunized children developed polio that year. He stated that there were 89 cases among the general population of 51,400, or 1.7 cases per 1,000 population, indicating that several cases could have been expected among the vaccinated children if they had not been immunized. But Brodie admitted that the population was too small to be statistically relevant, and continued to expand the vaccination program.

At a meeting of the American Public Health Association in St. Louis in November, 1935, Brodie presented the results of his large-scale immunization program. He field tested, through private physicians, another nine thousand children and used 4,500 un-vaccinated age and location matched children as controls.[35] Among the children vaccinated, there were three cases of paralysis that occurred soon after vaccination, but these patients had recently been exposed to the virus. There were two additional cases of polio in children without a history of previous exposure, one occurring 13 days after the child received only a single dose of vaccine. Brodie reported that in one trial, 652 children were vaccinated and none had contracted polio, whereas among the controls there were two cases (the number of controls was not specified). In Los Angeles County Hospital, there were no cases of disease among 42 vaccinated children (15 with the Kolmer vaccine) and three cases in the control group of fifty. In conclusion, he stated that none of a vaccinated group of seven thousand (he discounted the cases mentioned above) living in endemic or epidemic areas had developed polio, whereas five of a smaller control group had developed the disease. The United States Public Health Service set up a controlled trial of the vaccine in North Carolina and Virginia.[36] The results were presented at the same St. Louis meeting in November, 1935. Parents volunteered 1,452 children to be tested out of an eligible population of

34. Maurice Brodie and William H. Park, "Active Immunization Against Poliomyelitis," *New York State Medical Journal*, 1935, *35*:815.

35. Maurice Brodie and William H. Park, "Active Immunization Against Poliomyelitis," *American Journal of Public Health*, 1936, *26*:119.

36. Alexander G. Gilliam and Robert H. Onstott, "Results of Field Studies With Poliomyelitis Vaccine," *American Journal of Public Health*, 1936, *26*:113.

20,145 children. This group was in turn split in half, with half receiving and half not receiving the vaccine. Of the 726 children chosen for the vaccine, 458 actually appeared to receive the shots. No one in either the vaccinated or the control group developed polio. There was an attack rate of 74/100,000 in the eligible population who had not been included in the study. With this attack rate and an 80 percent effectiveness rate of the vaccine they predicted that approximately 15,000 applicants would be required for a difference to be statistically significant at P[0.05].

At this point the Brodie vaccine had shown itself to be a safe way to convert seronegative children to seropositive, and to assure those vaccinated a very low attack rate of polio. The vaccine appeared to fulfill all the demands of a vaccine and awaited more comprehensive field trials to confirm its efficacy.

The Final Verdict

Thus by 1935, there were two vaccines in the field: Kolmer's live virus vaccine and Brodie's formalized virus. Both had proven able to induce immunity among humans, but awaited wide-scale testing.

Several researchers attempted to verify the comparative efficacy of these vaccines. The most comprehensive and best presented studies were those of Sidney D. Kramer, submitted to the *Journal of Immunology* in May 1936.[37] Dr. Kramer was at the Laboratories of the Infantile Paralysis Commission of the Long Island College of Medicine, and his work was supported by various sources, including the President's Birthday Ball Commission for Infantile Paralysis Research (the forerunner of the National Foundation for Infantile Paralysis, now known as the March of Dimes). He had earlier worked with Dr. William H. Park of the Bureau of Laboratories on an unsuccessful attempt to develop a vaccine based on injecting a mixture of live virus and convalescent serum.[38] Kramer then undertook to independently evaluate both Kolmer's and Brodie's vaccines.

37. Sidney D. Kramer, "Active Immunization Against Poliomyelitis. A Comparative Study I. Attempts at Immunization of Monkeys and Children With Formalized Virus," *Journal of Immunology,* 1936, *31*:167; Sidney D. Kramer and L. H. Grossman, "Active Immunization Against Poliomyelitis. A Comparative Study II. Experimental Immunization of Monkeys With Virus Treated With Sodium Ricinoleate," *Journal of Immunology,* 1936, *31*:183.

38. Sidney D. Kramer, Martin Schaeffer, and William H. Park, "Poliomyelitis: Active Immunization — Method for Producing Detectable Amounts of Neutralizing Substance in Macacus Rhesus With Non-Infective Mixtures of Immune Serum and Virus," *Journal of Immunology,* 1934, *27*:199.

Kramer gave two doses of Brodie's vaccine to 17 monkeys and found that 13 had no humoral response and nine of 12 had no tissue resistance to intracerebral injection.[39] More importantly, he compared the rates of conversion to seropositivity between children who had been vaccinated with Brodie's vaccine and those who had not been vaccinated. When retested approximately two months later, 50 percent of the vaccinated group and 41 percent of the unvaccinated group had converted; thus there was no significant difference in the rate of seroconversion. If, as Aycock and Hudson pointed out in a similar study published in April, 1936,[40] the total number of initially seronegative and seropositive children is used as the denominator instead of only the number of the seronegative children, then the difference in rates of antibody presence are even smaller, the increase in immunity being 19.3 percent in the vaccinated children and 14.9 percent in the unvaccinated group.

Kramer then looked at the immunization of monkeys with Kolmer's sodium ricinoleate-treated virus.[41] Of 30 monkeys vaccinated with Kolmer's vaccine, 14 failed to produce antibodies and 14 of the 16 who did develop antibodies succumbed to intracerebral inoculation of virus. Kramer also cited a personal communication from Kolmer stating that he no longer believed the sodium ricinoleate caused any appreciable attenuation of the virus. Kolmer had withdrawn his vaccine in September of 1935 because of the nine reported deaths.

The final verdicts on the vaccines were reached at two conferences, arranged by the American Public Health Association, which took place in September and November of 1935 in Milwaukee and St. Louis. It was at the second conference that the greatest debate on the vaccines took place. Dr. James Leake of the United States Public Health Service took the lead in castigating the vaccines as dangerous or at best ineffective. Dr. Thomas Rivers, a renowned virologist, was present at this meeting, and he himself presented a paper denouncing the vaccines. In his oral history, conducted by Saul Benison, he remembers:

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39. Kramer, "Active Immunization. A Comparative Study I," p. 167.

40. William L. Aycock and C. Curtis Hudson," The Development of Neutralizing Substance for Poliomyelitis Virus in Vaccinated and Unvaccinated Individuals," *New England Journal of Medicine*, 1936, *214*:715.

41. Kramer and Grossman, "Active Immunization. A Comparative Study II," p. 183.

> as soon as I finished giving my paper (mine was the last in this particular session) and the floor was opened to discussion, Leake was on his feet. I want to tell you, he was hot under the collar. He presented the clinical evidence to the effect that the Kolmer live-virus vaccine caused several deaths in children and then point blank accused Kolmer of being a murderer.
>
> All hell broke loose, and it seemed as if everybody was trying to talk at the same time. A little later Dr. Brodie got up and said, "It looks as though, according to Dr. Rivers, my vaccine is no good, and, according to Dr. Leake, Dr. Kolmer's is dangerous." He sat down and Dr. Kolmer got up. He didn't refer to me at all. He just said, "Gentlemen, this is one time I wish the floor would open up and swallow me." He then sat down.[42]

Dr. Kolmer went on to do research in other areas of medicine and continued to be a well-respected professor at Temple University. Dr. Brodie was fired from his job at the New York University because of the vaccine controversy, and took a job as a pathologist at a non-university hospital in Detroit. He died, according to his obituary, of coronary occlusion in 1939 at age thirty-six.[43]

Conclusion

The conclusions at the end of the vaccination trials were these: Kolmer had developed a vaccine which consisted of injecting virulent virus, and Brodie had developed a vaccine which consisted of injecting non-immunogenic or weakly immunogenic material. And yet the ultimately efficacious vaccines of the 1950s were very similar to those that failed in the 1930s. The Salk vaccine is a formalized mixture of human polio viruses and the Sabin vaccine is a mixture of naturally occurring, attenuated virus species passed through generations of mice to reduce their virulence in humans.

It is remarkable that a great deal of research was done with children as experimental subjects. But at that time there was no good animal model for the disease. Monkey trials were not predictive of human response and monkeys were expensive to raise and maintain. Brodie and Kolmer were aware of the risks involved with human experimentation. In an attempt to prove the "safety" of the vaccines both first inoculated themselves, and Kolmer inoculated his chil-

42. Saul Benison, *Tom Rivers: Reflections on a Life in Medicine and Science* (Cambridge, MA: MIT Press, 1967), p. 189.

43. Rothbart, "In Memorium," p. 9.

dren. However, the price for failure with humans as test subjects was very high. This risk and resultant failure retarded further polio vaccine research and delayed the ultimate success, to which they were already very close, for another 20 years.

Finally, it is not at all clear that the conclusions about Brodie's vaccine reached in 1935 were valid. Kolmer's vaccine was indeed flawed; the incidence of polio in his test subjects was too high to allow its continued use. However, the same cannot be said for Brodie's vaccine. It was rejected largely because it did not produce immunity greater than the natural immunity found in the population, which earlier studies estimated to be approximately 75 percent. However, the vaccine safely and reliably produced for children the same level of immunity found naturally in adults. Obviously, a vaccine should not induce the disease, but there was no firm evidence the Brodie vaccine was associated with the development of polio.

Unfortunately, it is also not apparent that the infection rate for the vaccinated group was any lower than for the unvaccinated group. Brodie's vaccine was judged a failure due to lack of understanding that more than one strain of polio might be involved, which would limit the efficacy of a single-virus vaccine; if different strains of virus were used for immunization and neutralization, as may have been the case in Kramer's retesting of the vaccine, the test results were fatally flawed. It is now known that nearly one hundred percent of the adult population were immune to polio; the presence of 25 percent non-immune adults was due to the insensitivity of testing techniques in the 1930s. Therefore, Brodie's vaccine may well have been efficacious in safely inducing immunity in the test subjects to a single strain of poliovirus. However, since convenient test animals did not become available until the 1940s, Brodie could not defend his vaccine. Perhaps more importantly, the leading authorities on polio research, such as Simon Flexner at the Rockefeller Institute, did not believe a killed virus polio vaccine was possible.[44] Therefore, when the seemingly negative results of Brodie's vaccine were presented along with the more disastrous results from Kolmer's vaccine, Brodie's work was easily dismissed.

It is possible that an effective polio vaccine had been developed by Maurice Brodie in 1935. However, the science and medicine of

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44. Simon Flexner, "Concerning Active Immunization in Poliomyelitis," *Science*, 1935, *82*:420.

his era had neither the knowledge nor the technology to utilize this possible breakthrough. It would be another 20 years before science could achieve the foundation necessary for the successful development of a polio vaccine.

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Revisiting The Development of Thrombolytic Therapy: An Historical Perspective

SOL SHERRY

Anticoagulants that can prevent blood clotting have been available for physician use for nearly 50 years, but there was not a medical way to dissolve a blood clot until the development of thrombolytic therapy. Now that thrombolytic therapy has become established as an important modality in the treatment of an acute evolving transmural myocardial infarction, it is timely to describe its origin and development. The story is an interesting one that spans more than half a century: it started with a serendipitous observation made over 50 years ago, first applied to patients over 40 years ago, followed by a landmark study some 30 years ago; and it demonstrates how patience, perseverance and a continuum of sound clinical investigation succeeded in overcoming the impediments and skepticism that delayed its acceptance.

How It All Began

There are many heroes in this story but none greater than William S. Tillett (1892–1974)[1] (See Fig. 1), who discovered a streptococcal fibrinolysin, or fibrin-dissolving substance, in 1933 (fibrin is the main structural component of a blood clot) and provided the impetus to the development of thrombolytic therapy and the key to unraveling a hitherto little recognized human fibrinolytic enzyme system.[2] It was my privilege to work with him for five years (1946–1951) and, at his request, to undertake the initial clinical investigation and application of thrombolytic therapy in man. Because I have been involved in this subject ever since, and am well acquainted with the major developments in this field as well as the leading investigators, this article represents a personal overview of the origins of thrombolytic therapy.

1. Sol Sherry, "William Smith Tillett, 1892–1974," *Transactions of the Association of American Physicians*, 1975, *88*:32; other material about Tillett is based on personal conversations with the author.

2. William S. Tillett and R. L. Garner, "The Fibrinolytic Activity of Hemolytic Streptococci," *Journal of Experimental Medicine*, 1933, *58*:485.

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Figure 1. William Smith Tillett. Photo taken in 1951 at age fifty-nine. Courtesy of Sol Sherry, M.D.

At the time of his discovery of the streptococcal fibrinolysin, Tillett was an associate professor of medicine and Director of Laboratories at the Johns Hopkins Hospital. He had earned his M.D. at Johns Hopkins University Medical School in 1917, and after two years in France during World War I, he returned to Baltimore for clinical training. From 1922 until he joined the faculty at Hopkins in 1930, he worked at the Rockefeller Institute under several of the outstanding infectious disease investigators of that period (Thomas M. Rivers, Rufus Cole, and the biologically oriented Oswald T. Avery). Under Avery's influence, Tillett developed a strong biological interest, centered primarily around the pneumococcus, which he referred to as a "regal organism not dependent on the production of extracellular toxins, but still capable of producing a devastating illness," and the hemolytic streptococcus, an organism which he described as having "no fat or gristle, just metabolic machinery."[3]

Tillett, in his approach to science, was not very concerned

3. Personal communication by William S. Tillett to author, circa 1947.

with minutiae, nor particularly impressed with statistics; he was primarily interested in opening up new areas of investigation. Perhaps some understanding of the man, and what he believed to be important in medical research, may be seen in his remarks at the 1957 dedication of the newly constructed laboratories at Bellevue Hospital that were to bear his name. In his remarks, Tillett stated that he hoped one of the laboratories would have only benches for sitting and thinking, and a single growing plant in the center of the room. He thought this could be one of the most important of the Tillett laboratories, i.e. a place for investigators to reflect both on the wonders of nature and whether their approach to medical research had biological significance.

Tillett's approach to science was also reflected in his enjoyment of what he called "dinosaur egg experiments." When I questioned him as to his meaning, he gave the following explanation. Once there was an American paleontologist who had just returned from the Gobi Desert with the major find of a lifetime of work — two dinosaur eggs. Upon his return to the United States, he gave one to the Smithsonian Institution and kept the other for himself. A businessman, noting a small newspaper item about this event, asked the professor whether he would sell his egg and urged him to think the matter over. The professor gave it some thought and considering the meagerness of his pension, decided that for a million dollars he would part with it. Thereupon the businessman quickly wrote out a check. A reporter, after confirming the sale, said to the businessman, "That was an enormous price to pay for that egg. You don't really think it will hatch, do you?" To which the businessman, with a twinkle in his eye and a shake of his index finger, quickly retorted, "Ah, but what if it does!"

Tillett's own investigational career balanced "dinosaur egg experiments" with the more conventional techniques of research. When he made an observation that he believed was worthy of further study, he was tenacious in following it up. Under the influence of Avery he had become very interested in acute phase reactants — new or increased amounts of reactive substances which appeared in the circulation after an inflammatory event — following a pneumococcal or streptococcal infection. While at the Rockefeller Institute, he and Thomas Francis, Jr., described the appearance of a protein present in the acute phase sera of pneumonia patients, but not in the sera of convalescent individuals, which precipitated the "C fraction" carbohydrate present in all strains of pneumococci.

This precipitin reaction was later found to occur in the acute phase of a wide variety of diseases of diverse etiology in which there was an acute inflammatory reaction. Assay of this "C Reactive Protein" (CRP), like the erythrocyte sedimentation rate (ESR), became a very useful clinical test for determining the presence of acute inflammation. Subsequently it was also shown that C Reactive Protein was capable of triggering the alternative pathway of complement activation.

At Hopkins, Tillett continued his studies on acute phase reactants, and observed that the plasma of acutely ill patients caused a flocculation or clumping with Group A hemolytic streptococci, while their sera did not.[4] And here, as he told me, is where serendipity entered into the discovery of the streptococcal fibrinolytic principle, which subsequently opened the doors to the study of fibrinolysis, thrombolysis, and thrombolytic therapy.

Based on his observation, Tillett suspected that fibrinogen was, in some way, responsible for this "agglutination."[5] He reasoned that if this clumping was due to a reaction between fibrinogen and streptococci, the addition of a heavy inoculum of a streptococcal culture to oxalated human plasma would bind up all of the fibrinogen so that clotting would not occur upon recalcification. However, when clotting occurred upon recalcification just as rapidly as in the control tube, he left the laboratory disappointed and did not even remove the test tubes from the incubator. When he returned and was about to discard the tubes, he noticed that the specimen to which the streptococcal culture had been added was now liquid. This puzzled him, since he was sure the plasma-culture mixture had clotted upon recalcification. When he repeated the experiment, the plasma-culture mixture clotted and then after a number of minutes suddenly liquified, an event in sharp contrast to the control plasma specimen.

Shortly thereafter, Tillett teamed up with a young Ph.D. biochemist, R. L. Garner, a Fellow in the department of medicine, and they began a much more extensive investigation of this fibrin dissolving phenomenon. In a series of studies, they demonstrated that the fibrinolysin, which was an extracellular product made by

4. William S. Tillett and R. L. Garner, "The Agglutination of Hemolytic Streptococci by Plasma A Fibrinogen," *Bulletin Johns Hopkins Hospital*, 1934, *54*:145.

5. A similar type finding ultimately formed the basis for the staphylococcal clumping test as a measure of incoagulable fibrinogen/fibrin degradation products in serum.

the streptococcus, probably was a protein, and presumably a highly selective enzyme specific only for human fibrin; and also that the digestion of fibrin was a limited hydrolytic process.[6] Interestingly, they also described that after a period of time, incubation of their fibrinogen preparation with the fibrinolysin rendered the fibrinogen incoagulable.

Since little was made of this latter observation, they based the specificity of the streptococcal fibrinolysin for fibrin on the following evidence: that the former did not degrade casein or gelatin as did trypsin; that it was distinct in characteristics from the proteolytic enzyme which could be released from disrupted streptococcal cells; that only human but not rabbit fibrin could be dissolved readily by the fibrinolysin; and that the lysis of human fibrin was accomplished with relatively little release of amino nitrogen.

In the light of his various observations, including the effects on a human fibrinogen preparation, I suspect that had Garner continued with his studies, he would have recognized that fibrinolysis, as induced by the streptococcal protein, was indirect, as was ultimately described.[7] However, Garner left to join the faculty of the Department of Chemistry at the University of Michigan, where his research took an entirely different direction.

Tillett, on the other hand, continued to pursue his original observation after leaving Johns Hopkins for New York University's School of Medicine in 1938.[8] Based on his research training at the Rockefeller Institute, he concentrated on characterizing the streptococcal strains which did and did not elaborate a fibrinolysin; studied a variety of other bacterial strains in search of a similar type of substance; demonstrated the appearance of a specific antifibrinolysin in the serum of patients recovering from hemolytic streptococcal infections; and concluded that the production of a fibrinolysin had little to do with the virulence of the organism or the cause or

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6. R. L. Garner and William S. Tillett, "Biochemical Studies on the Fibrinolytic Activity of Hemolytic Streptococci. I. Isolation and Characterization of Fibrinolysin," *Journal of Experimental Medicine*, 1934, *60*:239; R. L. Garner and William S. Tillett, "Biochemical Studies on the Fibrinolytic Activity of Hemolytic Streptococci. II. Nature of the Reaction," *Journal of Experimental Medicine*, 1934, *60*:255.

7. David K. McClintock and Paul H. Bell, "The Mechanism of Activation of Human Plasminogen by Streptokinase," *Biochemical and Biophysical Research Communications*, 1971, *43*:694.

8. Tillett had moved to New York University's medical school in 1938, serving first as Chairman of the Bacteriology Department and shortly thereafter as Chairman of the Department of Medicine.

complications associated with a streptococcal infection.[9] He believed the biological purpose of the fibrinolysin was to provide the streptococcus with a soluble form of nutrient from any fibrin which had been deposited in and around a hemolytic streptococcal infection.

Streptococcal Fibrinolysin is an Activator of a Human Fibrin Dissolving Enzyme System

Subsequent to the observations of Tillett and Garner, Haskell Milstone, a research fellow working in Tillett's laboratory, reported in 1941 that clots made with highly purified human fibrinogen and thrombin were not lysed by streptococcal fibrinolysin. However, if a small amount of the euglobulin protein fraction of human serum was added to the mixture, rapid lysis of the clot resulted (the serum euglobulin could be readily isolated by isoelectric precipitation at pH 5.2). Milstone named this substance "plasma lysing factor," and believed that it interacted with streptococcal fibrinolysin to form an active lysing system.[10] After completing his fellowship, Milstone joined the Pathology Department at Yale where his subsequent investigational career centered around the study of thromboplastin (tissue factor) in blood clotting.

Between 1943 and 1945, two men of science, L. Royal Christensen and Melvin Kaplan, independently demonstrated that the "lysing factor" in the plasma euglobulin described by Milstone was in reality an active precursor of a human proteolytic enzyme capable of readily degrading insoluble fibrin into soluble fragments. Kaplan, a physician-scientist interested in rheumatic fever and working for the military at Fort Bragg, and Christensen, a biochemically oriented microbiologist in Colin MacLeod's Microbiology Department at New York University, further demonstrated this proenzyme could be rapidly activated by streptococcal fibrinolysin.[11] Because the

9. William S. Tillett, "The Occurrence of Antifibrinolytic Properties in the Blood of Patients With Acute Hemolytic Streptococcus Infections," *Journal of Clinical Investigation,* 1935, *14*:276; "The Fibrinolytic Activity of Hemolytic Streptococci," *Bacteriological Reviews,* 1938, *2*:161.

10. Haskell Milstone, "A Factor in Normal Human Blood Which Participates in Streptococcal Fibrinolysis," *Journal of Immunology,* 1941, *42*:109.

11. L. Royal Christensen, "The Mechanism of Streptococcal Fibrinolysis," *Journal of Bacteriology,* 1944, *47*:471; L. Royal Christensen, "Streptococcal Fibrinolysis: a Proteolytic Reaction Due to a Serum Enzyme Activated by Streptococcal Fibrinolysis," *Journal of General Physiology,* 1945, *28*:363; Melvin H. Kaplan, "Nature and Role of the Lytic Factor in Hemolytic Streptococcal Fibrinolysis," *Proceedings Society Experimental Biology & Medicine,* 1944, *57*:40.

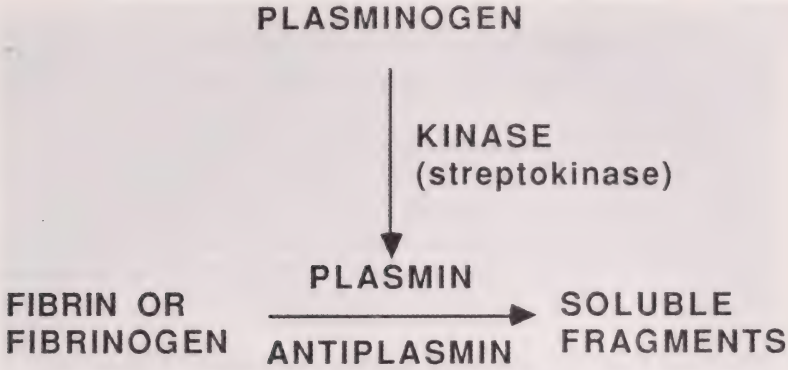

Figure 2. Original schema of plasminogen-plasmin enzyme system and the role of streptokinase as described by Christensen in 1945.
Courtesy of Sol Sherry, M.D.

streptococcal product was an activator rather than a fibrinolysin, Christensen and MacLeod recommended that it be renamed streptokinase.[12]

Thus the stage was set for Christensen, on the basis of his more extensive and classic studies, to point out that the phenomenon of fibrinolysis was due to the same proteolytic enzyme that had been observed in chloroform-treated serum, and to further show that it existed in the native state as an inactive precursor rapidly activated by streptokinase.

This view, which was fundamental to all subsequent research, is summarized in Figure Two. As shown in Figure Two, the naturally occurring precursor of the proteolytic (and fibrinolytic) enzyme of plasma was referred to as plasminogen because of its source (plasma), although the term profibrinolysin remained a favorite among many "coagulationists" for many years. In the presence of an activator or kinase, this plasma globulin was rapidly converted to an active proteolytic enzyme termed plasmin to denote its source of origin. Plasmin, although it digested fibrin into several soluble incoagulable fragments, was not restricted in its action to fibrin. It proved to be a proteolytic enzyme resembling trypsin in its action. For this reason, the terminology plasminogen and plasmin proved preferable, and was in keeping with the terminology of trypsinogen and trypsin. Further, Christensen noted the presence of considerable

12. L. Royal Christensen and Colin M. MacLeod, "A Proteolytic Enzyme of Serum: Characterization, Activation, and Reaction With Inhibitors," *Journal of General Physiology*, 1945, *28*:559.

antiplasmin (inhibitory) activity in plasma, as was typical of all biologically active proteolytic enzyme systems with their checks and balances.

The description of a native enzyme system with activators and inhibitors, and concerned with fibrinolysis, coordinated a host of observations dating back for more than a century. These observations included the spontaneous liquefaction of clotted blood, tissue fibrinolysis, and the proteolytic activity which could be generated in blood.[13]

The Initiation of Therapeutic Studies

Therapeutic studies began immediately following Christensen's research. In working out the role of streptokinase as an activator of plasminogen, he partially purified the bacterial protein.[14] The method he developed allowed him, in 1946, to begin to provide Tillett with sufficient material to initiate its investigation as a fibrinolytic and blood clot dissolving agent. Since streptokinase was a poor activator of the plasminogens of experimental animals commonly employed in laboratory investigation, Tillett decided to begin the study on human subjects. At that time, I was finishing a residency in Internal Medicine on his service at Bellevue Hospital. As I had had a considerable amount of prior research experience (both as a medical student and research fellow, and in typhus control during World War II) and was adept both in setting up new methodology and in patient care, Tillett asked me to join him in his laboratory. I was to be responsible for the clinical and laboratory studies. Initially, Christensen was very helpful to me while I was setting up the fibrinolytic assays and in supplying necessary reagents, but within a few years he lost interest in fibrinolysis research and accepted a position as head of a large animal facility at the medical school.

Initial Extravascular Clinical Studies

Christensen's streptokinase preparation proved to be only 10 percent pure; it contained a variety of very potent extracellular strepto-

13. Sol Sherry and Norma Alkjaersig, "Studies on the Fibrinolytic Enzyme of Human Plasma," *Thrombosis and Diathesis Haemorrhagica,* 1957, *1*:264.

14. L. Royal Christensen, "Protamine Purification of Streptokinase and Effect of pH on Reversible Inactivation," *Journal of General Physiology,* 1947, *30*:465.

coccal enzymes including a deoxyribonuclease, hyaluronidase, and several nucleotidases and nucleosidases. I recall asking Karl Meyer, a noted authority on hyaluronidase, to check on this enzyme's activity within the preparation. He told me it was the most active preparation of hyaluronidase he had ever encountered. At a later date, Arthur Kornberg, the Nobelist, asked me for a sample to evaluate its deoxyribonuclease activity; he later responded that it was the most active preparation of DNase he had ever examined. When the streptococcus produced extracellular proteins, they were potent indeed!

However, because of its many impurities, the preparation in this early form was unsuitable for intravascular administration. Also, at the time, there were no techniques available for demonstrating thrombus dissolution in the blood vessels of patients. Consequently, the decision was made to initiate studies in the chest utilizing cases of hemothorax, loculated effusions, and empyemas — in treating the latter, the preparation's deoxyribonuclease, which we termed streptodornase, rapidly reduced the viscosity of thick purulent exudates and facilitated their drainage. Serial roentgenograms allowed observations of the effects, samples of fluid could be removed for analysis, and ample patient material was always available at Bellevue Hospital, in the proximity of New York University Medical School, where Tillett headed the Third Medical Division.

In 1947, we carried out the first therapeutic test of streptokinase in a patient. The roentgenogram shown on the left in Figure Three is from a febrile young man with a loculated hemothorax following removal of the left lung. We suspected an infection but the small amounts of fluid which could be aspirated were sterile. By injecting 400,000 units of streptokinase into the chest, we proceeded to determine whether we could dissolve the hemothorax and expose the infection. The choice of streptokinase dose was interesting. On the basis of experimental observations, I had concluded that 200,000 units injected intrapleurally could be expected to initiate an active clot dissolving state and I recommended this dosage to Tillett. He countered by saying, "Let's go for broke! Try 400,000 units." In addition to all his other attributes, he was not adverse to gambling.

The results were sensational. Six hours after the injection, fluoroscopy revealed the breakdown of all the loculations and free mobility of the fluid in the chest. The roentgenogram on the right

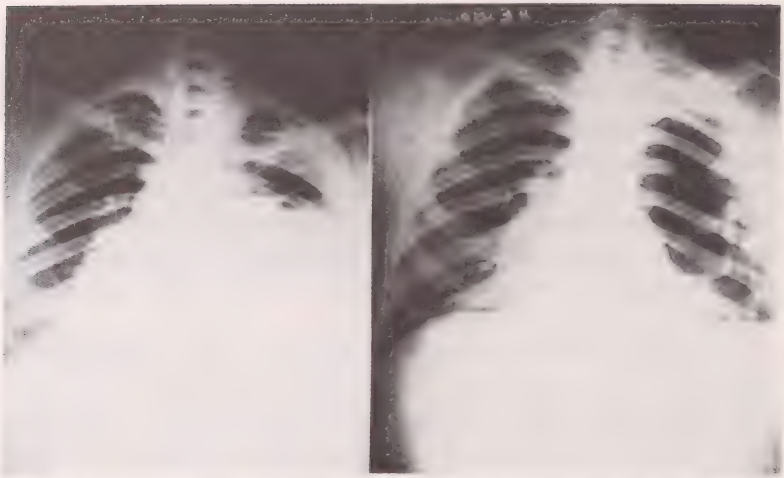

Figure 3. Chest roentgenograms of the first patient to be treated with streptokinase for therapeutic purposes. *Left*: Film taken immediately prior to treatment. *Right*: Film taken following evacuation of lysed coagulum by needle aspiration.
Courtesy of Sol Sherry, M.D.

in Figure Three was taken soon thereafter, but following the removal of 1,300 ml of lysed coagulum; it shows the pleural space drained of its previous contents. Fortunately, the fluid was sterile and the temperature spontaneously reverted to normal.

In 1949, the first publication appeared on the lysis of fibrin and clotted blood in patients; it also contained observations on the rapid lysis of thick purulent exudates by the streptodornase in the preparation. This finding was soon followed by the application of the enzyme mixture for producing an enzymatic debridement in a wide variety of clinical problems.[15] Figure Four shows a photo of the research team at that time; a ward of Bellevue Hospital serves as a backdrop. Besides Tillett, Christensen, and myself, there was George Hazlehurst, who left shortly after a research fellowship to enter private practice, and Alan Johnson, who was to make several

15. William S. Tillett and Sol Sherry, "Effect in Patients of Streptococcal Fibrinolysin (Streptokinase) and Streptococcal Deoxyribonuclease on Fibrinous, Purulent, and Sanguinous Pleural Exudations," *Journal of Clinical Investigation*, 1949, *28*:173; William S. Tillett, Sol Sherry, L. Royal Christensen, Alan J. Johnson, and George Hazlehurst, "Streptococcal Enzymatic Debridement," *Annals of Surgery*, 1950, *12*:131.

Figure 4. Research team at New York University School of Medicine involved in the pioneering investigation of fibrin dissolving therapy. Photo taken in 1950. Seated (L to R): George Hazlehurst, William S. Tillett, L. Royal Christensen. Standing (L to R): Alan Johnson, Sol Sherry.
Courtesy of Sol Sherry, M.D.

important and fundamental contributions to the development of thrombolytic therapy.

Background Studies of Intravascular Thrombolysis

The development of streptokinase for intravascular thrombolysis now became the main objective of the research program, and especially for the treatment of an acute myocardial infarction. This condition was a frequent cause of admission to a Medical Service; the in-hospital morality rate was high (about 30 percent); and acute coronary thrombosis and acute myocardial infarction were considered synonymous.[16] Lederle Laboratories undertook the further purification of streptokinase while Alan Johnson, the dedicated, meticulous and soft-spoken investigator who had joined our team

16. Several well known pathologists in the 1930s had pointed out that the most common cause of a myocardial infarction was a thrombus superimposed on the cracked surface of an atheromatous plaque.

in 1948, set out to determine whether a sustaining infusion of the preparation of streptokinase in use at that time, when administered via a distant peripheral vessel, could dissolve experimental thrombi induced in the ear veins of rabbits. His was the first demonstration of the successful lysis of thrombi by a thrombolytic agent in an experimental animal and was reported in 1952.[17]

Another major step in the study of this subject occurred in 1953 when Daniel Kline at Yale (subsequently Chairman of Physiology at the University of Cincinnati School of Medicine) reported on a much improved method for the purification of human plasminogen. It was now possible to prepare a human plasmin preparation by converting Kline's plasminogen to plasmin in vitro through the addition of streptokinase. This was quickly utilized by Eugene Cliffton, a surgeon at Sloan Kettering Institute; he and his associates reported that their preparation, which they referred to as human plasmin, when infused intravenously mediated the lysis of experimentally induced thrombi in dogs and rabbits. The major question that now arose was whether plasmin or a plasminogen activator would be the best type of agent for therapeutic purposes.

It was difficult to envision how the body would use a nonspecific trypsin-like proteolytic enzyme in the circulation to dissolve fibrin, especially since there were large amounts of inhibitory proteins in plasma. I suspected that there were special fibrinolytic properties associated with the presence of a plasminogen activator. Consequently, while at the May Institute for Medical Research in Cincinnati, where Walter Troll, a brilliant young biochemist, and I had re-located in 1951, an investigation of this possibility was begun. In vitro studies on clot lysis suggested that fibrinolysis, as a selective process, was dependent on the presence of a plasminogen activator.[18]

Furthermore, our study indicated that the interpretation of Cliffton, et al., of the lysis of experimental thrombi in dogs and rabbits as due to human plasmin might not be correct. Their preparation of human plasmin was a mixture of an activator and human plasmin; thus, the results could just as well be due to the presence of activator activity rather than human plasmin. Our studies in

17. Alan J. Johnson and William S. Tillett, "Lysis in Rabbits of Intravascular Blood Clots by the Streptococcal Fibrinolytic System (Streptokinase)," *Journal of Experimental Medicine,* 1952, *95*:449.

18. Sol Sherry, "Fibrinolytic Activity of Streptokinase Activated Human Plasmin," *Journal of Clinical Investigation,* 1954, *323*:1054.

Figure 5. St. Louis research team responsible for the introduction of thrombolytic therapy with streptokinase for clinical use. Photo taken in 1966. L to R: the late Anthony P. Fletcher, Norma Alkjaersig and Sol Sherry.
Courtesy of Sol Sherry, M.D.

animals led to the conclusion that the thrombolytic results reported by Cliffton and his colleagues were more likely due to the activator activity of the preparation (based on its streptokinase content) rather than its plasmin content.[19]

In mid-1954, the further investigation of the fundamental question of whether a plasminogen activator or plasmin was the most desirable agent for thrombolytic therapy shifted to St. Louis, first at the Jewish Hospital of St. Louis, and subsequently at Washington University School of Medicine. There two outstanding investigators (See Fig. Five) joined me to pursue this problem and unravel the mechanism by which the body dissolves clots. First to associate was Norma Alkjaersig, a Dane who had originally trained at the Carlsberg Institute with Tage Astrup, a notable pioneer in the biol-

19. Sol Sherry, Antoinette Titchener, Leonard Gottesman, Philip Wasserman and Walter Troll, "Enzymatic Dissolution of Experimental Arterial Thrombi in the Dog by Trypsin, Chymotrypsin, and Plasminogen Activators," *Journal of Clinical Investigation,* 1954, *33*:1303.

ogy of fibrinolysis. Alkjaersig had come to the United States to work with the distinguished coagulationist, Walter Seegers, at Wayne University School of Medicine. She was followed a year later by the Englishman Anthony Fletcher, who, after his medical training at St. Mary's in London, had emigrated to the States as a Merck Fellow in the Department of Microbiology at New York University. There he had collaborated with Tillett and Johnson in their continuing studies on the development of streptokinase for intravascular thrombolysis. Alkjaersig and Fletcher complemented each other beautifully. She was hardworking, serious, skilled technically, and patient in the training of technicians and fellows; he was imaginative and quick to adapt new methodology and technology to our studies. Their relationship also blossomed outside the laboratory, for she subsequently became Mrs. Fletcher.

At this juncture, based on previous observations, we suspected that the key to thrombolysis was the appearance of a plasminogen activator in the proximity of fibrin rather than the presence of plasmin in the systemic circulation. But how to prove it? Accordingly three types of studies were undertaken: 1) the nature and identification of the constituents in the circulation responsible for physiologically and pharmacologically induced fibrinolytic activity in humans; 2) characterization of the biochemical events occurring in the plasma of patients during thrombolytic therapy; and 3) in vitro studies on labeled clots of different plasminogen contents exposed to varying concentrations of plasminogen activators *or* plasmin in buffer.[20]

On the basis of these studies, it was shown that the primary and most sensitive mechanism for thrombolysis was the activation of the plasminogen that bound to fibrin during the clotting of blood; its activation at the fibrin site was by a plasminogen activator diffusing into the thrombus from the circulating blood. This finding clarified the special fibrinolytic properties of a plasminogen activator, explained the physiological mechanism for dissolving fibrin, and

20. Sol Sherry, Robert I. Lindemeyer, Anthony P. Fletcher, and Norma Alkjaersig, "Studies on Enhanced Fibrinolytic Activity in Man," *Journal of Clinical Investigation,* 1959, *38*:810; William D. Sawyer, Anthony P. Fletcher, Norma Alkjaersig, and Sol Sherry, "Studies on the Thrombolytic Activity of Human Plasma," *Journal of Clinical Investigation,* 1960, *39*:426; Anthony P. Fletcher, Norma Alkjaersig, and Sol Sherry, "Maintenance of a Sustained Thrombolytic State in Man. I. Induction and Effects," *Journal of Clinical Investigation,* 1959, *38*:1096; Norma Alkjaersig, Anthony P. Fletcher, and Sol Sherry, "Mechanism of Clot Dissolution by Plasmin," *Journal of Clinical Investigation,* 1959, *38*:1086.

determined the future direction for the development of thrombolytic agents (all those in current use are plasminogen activators).

The Beginning of Thrombolytic Therapy For Clinical Use Including Acute Myocardial Infarction

As the above studies were concluding, preparations of streptokinase were made available which, when infused intravenously, were well tolerated in patients and, in the absence of trauma or invasive procedures, with few bleeding complications. Such preparations accelerated markedly the development of thrombolytic therapy. A rational approach to thrombolysis in vivo with streptokinase was first described in 1957.[21] It involved a loading dose and sustaining infusion sufficient to raise the clot dissolving activity of plasma several hundred fold. In the meantime, Johnson, who had remained at New York University's Medical School, demonstrated that a similar system was effective in dissolving experimental thrombi in human volunteers.[22] An intravenous infusion into the opposite arm resulted, in most cases, in lysis of the clot and reestablished the patency of the vessel as shown in Figure Six.

The interest of our group in St. Louis, however, was to evaluate this regimen for clinical purposes, and in 1958 we reported the first trial of intravenously administered streptokinase in patients with an acute myocardial infarction.[23] The stated objective then, as now, was that "the rapid resolution of a coronary thrombus by enzymatic means could result in reduction of the final area of muscle infarction, reduction of the degree of electrical instability present during the early critical phase of infarction, and prevent the appearance of or lyse mural thrombi."[24] Incidentally, at the time of these studies, reduction of infarct size by thrombolytic therapy was being demon-

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21. Sol Sherry, Anthony P. Fletcher, Norma Alkjaersig, and Fotios E. Smyrniotis, "An Approach to Intravascular Fibrinolysis in Man," *Transactions Association of American Physicians,* 1957, *70*:288.

22. Alan J. Johnson and W. Ross McCarty, "The Lysis of Artificially Induced Intravascular Clots in Man by Intravenous Infusions of Streptokinase," *Journal of Clinical Investigation,* 1959, *38*:1627.

23. Anthony P. Fletcher, Norma Alkjaersig, Fotios E. Smyrniotis, and Sol Sherry, "Treatment of Patients Suffering From Early Myocardial Infarction With Massive and Prolonged Streptokinase," *Transactions Association of American Physicians,* 1958, *71*:287.

24. Ibid.

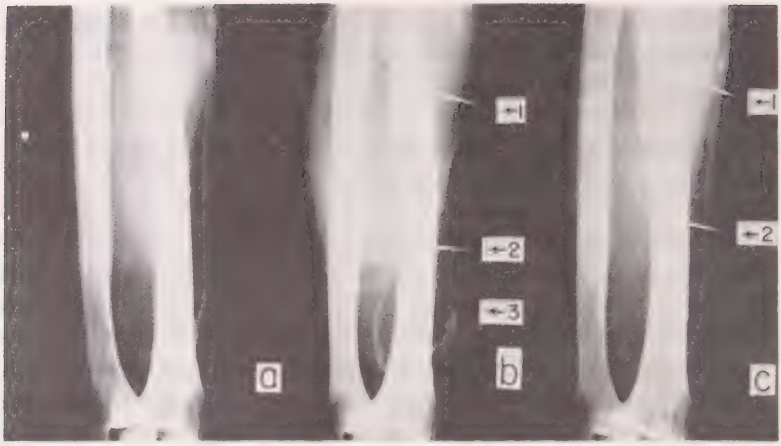

Figure 6. Demonstration of the patency of the lysis of an experimentally induced clot in a human volunteer by a streptokinase infusion. Panel "A" is of a venogram of a forearm vein before the induction of the clot; the vessel is patent. Panel "B" is the venogram taken 24 hours after the induction of the clot at the area marked "3;" note the obstruction of flow of dye beyond that point (the Nichrome stay wires labeled 1 and 2 delineate the extent of the clot which formed). Panel "C" is the venogram taken 24 hours following the streptokinase infusion showing restoration of the patency of the vein.

Courtesy of Sol Sherry, M.D.
Reprinted with permission from Alan J. Johnson, W. Ross McCarty, "The Lysis of Artificially Induced Intravascular Clots in Man by Intravenous Infusions of Streptokinase," *Journal of Clinical Investigation*, 1959, *38*:1627.

strated in dogs with an experimentally induced coronary thrombus.[25]

Not only were we encouraged by the lack of complications, but we observed that patients treated within the first 14 hours following symptom onset had a very low in-hospital mortality rate, while patients treated anywhere from 20 to 72 hours after symptom onset had a mortality rate similar to untreated patients. The details of these studies, which were published in 1959 and attracted wide attention, provided the basis for the use of plasminogen activators as thrombolytic agents not only for acute myocardial infarction but

25. Paul Ruegsegger, Irwin Nydick, Robert C. Hutter, et al., "Fibrinolytic (Plasmin) Therapy of Experimental Coronary Thrombi With Alteration of the Evolution of Myocardial Infarction," *Circulation*, 1959, *19*:7.

for pulmonary embolism, thrombophlebitis, and acute peripheral artery occlusions.[26]

The next 20 years saw an extended period of evaluation of thrombolytic therapy, primarily in Europe. It was also a period for the development of urokinase, a non-antigenic, native activator originally found in human urine and subsequently developed for therapeutic use.[27] Though these two activators became the subject of many clinical studies including a large number of randomized trials, thrombolytic therapy was not enthusiastically received. There was reluctance on the part of the medical community to accept the claims for clinical benefit, a reluctance founded on two mistaken beliefs. First, thrombolytic therapy was associated with an unacceptable incidence of hemorrhagic complications — a view resulting from an investigational study requiring multiple invasive procedures which served as the source of bleeding complications.[28] Second, many clinicians believed that acute coronary thrombosis was not the major incitant for a myocardial infarction, due to one study that received much publicity, despite the views expressed by other leading pathologists.[29] These beliefs remained widespread even after a report to the contrary was made at a Consensus Development Conference sponsored by the Food and Drug Administration and the National Institutes of Health.[30]

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26. Anthony P. Fletcher, Sol Sherry, Norma Alkjaersig, Fotios E. Smyrniotis, and S. Jick, "The Maintenance of a Sustained Thrombolytic State in Man, II. Clinical Observations on Patients With Myocardial Infarction and Other Thromboembolic Disorders," *Journal of Clinical Investigation,* 1959, *38*:1111.

27. J. R. B. Williams, "Fibrinolytic Activity of Urine," *British Journal of Experimental Pathology,* 1951, *32*:530; Tage Astrup and Ida Sterndorff, "An Activator of Plasminogen in Normal Urine," *Proceedings Society for Experimental Biology and Medicine,* 1952, *81*:675; Gerald W. Sobel, Stanley R. Mohler, Nelson W. Jones, A. B. C. Dowdy, and M. Mason Guest, "Urokinase an Activator of Plasma Profibrinolysin Extracted From Urine," *American Journal of Physiology,* 1952, *171*:768.

28. "Urokinase Pulmonary Embolism Trial Study Group, Urokinase Pulmonary Embolism Trial. A National Cooperative Study," *Circulation,* 1973, *47*(Supplement II):1.

29. William C. Roberts and L. Maximilian Buja, "The Frequency and Significance of Coronary Arterial Thrombi and Other Observations in Fatal Acute Myocardial Infarction," *American Journal of Medicine,* 1972, *52*:425; A. Bleakley Chandler, Irving Chapman, Leif R. Erhardt, et al., "Coronary Thrombosis in Myocardial Infarction," *American Journal of Cardiology,* 1974, *34*:823.

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Present State of Thrombolytic Therapy

The acceptance of thrombolytic therapy changed dramatically with the rediscovery in 1980 by Marcus A. DeWood and his associates that acute coronary thrombosis was the pathogenetic mechanism for most cases of acute transmural myocardial infarction.[31] Several cardiologists then showed that such thrombi could be dissolved rapidly by either the local installation of thrombolytic agents into the clotted coronary artery or by their administration intravenously, and that the therapy, when applied early after the onset of symptoms, could limit the amount of damage to the heart muscle and significantly reduce the mortality of such catastrophic events. This finding has led to the introduction of newer and possibly more effective thrombolytic agents and has stimulated a marked resurgence of interest in thrombolytic therapy for all forms of thromboembolic disease.[32] The time now seems ripe to acknowledge these earlier achievements in the development of thrombolytic therapy.

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31. Marcus A. DeWood, Julie Spores, Robert Notske, et al., "Prevalence of Total Coronary Occlusion During the Early Hours of Transmural Myocardial Infarction," *New England Journal of Medicine,* 1980, *303*:897.

32. S. Shaukat Hussain, Victor Gurewich, and Boguslaw Lipinski, "Purification of a New High Molecular Weight Form of Urokinase From Urine," *Thrombosis and Haemostasis,* 1981, *46*:11; Dingeman C. Rijken and Désiré Collen, "Purification and Characterization of the Plasminogen Activator Secreted by Human Melanoma Cells in Tissue Culture," *Journal of Biological Chemistry,* 1981, *256*:7035; Richard Anthony G. Smith, Robert J. Dupe, Peter D. English, and Joseph Green, "Fibrinolysis With Acyl Enzymes: a New Approach to Thrombolytic Therapy," *Nature,* 1981, *290*:505.

Dr. John Stockton Hough: Medical Bibliophile and Bibliographer

FRED B. ROGERS
THOMAS A. HORROCKS

Dr. John Stockton Hough, a nineteenth-century medical bibliophile and bibliographer, amassed a large and valuable collection of books pertaining to the history and literature of medicine. These books, purchased by the College of Physicians of Philadelphia after his death in 1900, are now among the chief treasures of the Historical Collections of it's library. A review of Dr. Hough's life and legacy is appropriate because of his remarkable achievements in a lifetime of 54 years.

John Stockton Hough was born at Yardley, Pennsylvania, on 5 December 1845. Of Quaker descent, his ancestor Richard Hough, of Cheshire, England, came to America with William Penn in 1683 and was a representative in the provincial assembly and a member of the supreme executive council of Pennsylvania. Dr. Hough's father, William Aspy Hough, was a landowner in Bucks County, and his mother née Eleanor Stockton, was a daughter of Mr. and Mrs. John Stockton of Princeton, New Jersey. Through his mother's family the son was a descendant of Richard Stockton, a signer of the Declaration of Independence.

John Hough received his secondary schooling in Trenton, New Jersey, pursuing a classical education at the Trenton Academy and the Model School. He completed college preparation at the Fort Edward Institute in New York, and from 1862–1863 attended Eastman's Business College at Poughkeepsie, New York. Interest in a medical career next prompted a preceptorship with Dr. John McKelway, a Scottish physician in Trenton.

In 1864 Hough entered the Philadelphia Polytechnic College, where he earned a bachelor's degree in chemistry in 1867, and a master's degree in chemistry three years later. During this time, Hough was simultaneously attending medical school at the University of Pennsylvania, and in 1868 he received an M.D. degree from that institution. The subject of his doctoral thesis was "Non-conge-

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niality of the elements of reproduction in the human species."[1] A special interest in reproduction and development was evident in the numerous items gathered on these topics in his library.

Following his graduation from medical school, Hough served as Adjunct Professor of Chemistry at Philadelphia's Central High School for several months prior to a year's internship at the Philadelphia General Hospital. While an intern, he made original discoveries concerning parasitic trichinae. During that year (1868–1869) Hough also served as a lecturer in physiology at the Wagner Institute of Philadelphia.[2]

From 1869 to 1874 Dr. Hough was in medical practice in Philadelphia, with an office at 20th and Walnut Streets. During this period, he also invented a process of constructing fire-proof buildings and wrote articles about surgical instruments, in addition to reports on embryology, hygiene, and vital statistics. Fourteen titles and places of publication of his writings were later listed in the *Index Catalogue* of the Surgeon-General's Office in Washington, D. C.[3] While residing in Philadelphia, he became a member of the Union League and the Philadelphia Athletic Club.

On 29 January 1874 Hough married Sarah M. Wetherill, daughter of Dr. and Mrs. William Wetherill of Philadelphia. The couple thereafter resided in London and Paris, and travelled extensively in Europe. In December of 1874 a daughter, Frances, was born to them; the mother died in Florence, Italy, shortly after her birth. Frances Hough died at age 18, in April 1893.

Returning to the United States, Hough settled in New York City, where he was elected a member of the Grolier Club and the University Club. His library, especially books printed in the fifteenth century, was collected with the assistance of the well-known bookman-printer Robert Hoe.

On 30 July 1887 Hough married Edith Reilly of New York City. Thereafter he was a gentleman farmer in Ewing Township, West Trenton, New Jersey. In 1889 he published at Trenton a catalogue with engraved title page, *Incunabula Medica*, and in January

1. *Catalogue of the Alumni of the Medical Department of the University of Pennsylvania* (Philadelphia: Society of the Alumni of the Medical Department, 1877), p. 87.

2. James Grant Wilson and John Fiske, eds., *Appleton's Cyclopaedia of American Bibliography, Vol. 3* (New York: D. Appleton and Company, 1887), p. 271.

3. *Index Catalogue of the Library of the Surgeon-General's Office, United States Army, Vol. 13* (Washington, D. C.: Government Printing Office, 1892), pp. 702–703.

Figure 1. John Stockton Hough.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

1890 a prospectus number of *Bibliotheca Medica Historico-literaria et Bibliographica*, a weekly periodical devoted to the bibliography and history of the literature of medicine. There was not sufficient encouragement to continue the latter publication, and it was limited to an initial issue. "American medical literature," bibliophile Dr. William Snow Miller later observed, "was thereby the loser."[4]

For these publications Hough collected a library of several thousand titles. He was also a collector of rare books in fine bindings, and owned several volumes bound in human skin.[5] A reporter

4. William Snow Miller, "John Stockton Hough (1845–1900)," in Howard A. Kelly and Walter L. Burrage, eds., *American Medical Biographies* (Baltimore: The Norman, Remington Company, 1920), p. 564.

5. Lawrence S. Thompson, "Books Bound in Human Skin," *American Notes & Queries: A Journal for the Curious*, 1944, 4:122–123.

Figure 2. John Stockton Hough's library.
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

for the *Trenton Times*, who visited Hough in Ewing in 1894, described the doctor's library as "a large cheerful room in terra cotta, with an open fire place, luxurious chairs, handsome, crowded book cases, and pictures and relics, the result of Dr. Hough's fourteen trips across the Atlantic." The collector himself, the reporter continued, was

> seated in a big arm chair before a table filled with books, occasionally quieting two interesting little boys, who appreciated the Sunday access to their father's library. Dr. Hough, still a young man in the record of men of prominence, took book after book in hand, calling some 'beauty,' 'marvelous gem,' 'nugget' and 'as exquisite as valuable,' spanning five centuries of life with a most entertaining bridge of knowledge, which partook of history, art, science and literature, colored and animated in a high degree, making the reporter's assignment for a morning call to last nearly a day.[6]

6. *Trenton Times*, 22 February 1894.

Late in April 1900 Hough was severely injured on being thrown from his carriage by a runaway horse; he died at home from these injuries on 6 May 1900.[7] Ironically, Hough was known throughout New Jersey for promoting good roads. The macadamizing of many roads was due to his efforts, and he was Mercer County Supervisor of Roads and an officer of the State Road Association at the time of his death.[8]

Burial was in Ewing Cemetery, Trenton. His widow, who died at age 69 in July 1930, and their six children survived. The youngest son, Arthur S. Hough, born a few month before his father's death, now resides in San Diego, California. The doctor's estate was reckoned at $200,000; it included real estate in Philadelphia, two farms in Ewing Township, and a half-interest in the Ewing Mill.[9] The Hough homestead, located on Scotch Road in Ewing near today's Glen Roc Shopping Center, now houses a civil air patrol office for adjacent Mercer County Airport.

In 1901 Hough's vast collection of books was purchased by the College of Physicians of Philadelphia through the office of Mr. Hoe. Dr. W. W. Keen, then president of the College, travelled to New York City to expedite this purchase, which was made possible by generous cash donations by Drs. George Fales Baker, S. Weir Mitchell, and his physician-son John K. Mitchell. The acquisition consisted of 3,247 volumes and 2,070 pamphlets and reprints — some very old and quite rare. The staff of the College library, led by librarian Charles Perry Fisher, separated the duplicates and non-medical material (which were later sold to the University of Pennsylvania), and kept the remaining 1,500 volumes (including 76 incunabula) and over one thousand pamphlets. Through this acquisition, the College library received rare editions of Bernard of Gordon, Ketham, Paré, Champier, and Benvenutus Grassus. The College received a real gem in Fabricius of Aquapendente's *De Formato Foetu* (Venice, 1600; Padua, 1604), which is an extremely rare embryological atlas. The Hough copy is unique, however, for having 30 bound-in folio plates, some of double size, reproducing in colors (probably gouache or tempera) most of the illustrations in the text. Only one other set of these magnificent plates is known to exist. Besides these plates, this spectacular volume also contains

7. *JAMA*, 1900, *34*:1210.

8. *Daily State Gazette* (Trenton), 7 May 1900.

9. Newspaper clipping of 7 May 1900. University Archives, University of Pennsylvania.

Figure 3. One of the remarkable paintings from Fabricius' *De Formato Foetu.*
Courtesy of the Historical Collections, College of Physicians of Philadelphia.

four polychrome woodcuts in folio for Gasparo Aselli's historic work on the lacteal vessels, *De Lactibus* (Milan, 1627). Some of them are represented in various stages of development, from the drawing to uncolored woodcut. The Aselli plates were the first colored illustrations to appear in an anatomical text. And there is more to be found in this treasure: the volume also contains two

anatomical fugitive sheets of a male and female, with superimposed flaps, printed in Venice in 1587, and three 1613 anatomical sheets, also with flaps.[10]

In closing, the authors refer the reader to William Snow Miller's biographical record of Dr. Hough. Dr. Miller, who subsequently purchased several duplicate volumes from the collection, provides a succinct description of Hough the bookman:

> The marginal notes and additions to his works on medical bibliography in the handwriting of Dr. Hough show that he was more than a mere collector of old and curious works; he was a profound student of books and of the times in which they were written.[11]

Acknowledgement

We gratefully acknowledge data given to us by Mr. Mark Frazier Lloyd, University Archivist, University of Pennsylvania; Mrs. Joan A. Sine, Ewing Cemetery Association, Trenton, New Jersey; and Mr. Arthur S. Hough of San Diego, California.

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10. "Annual Report of the Library," *Transactions & Studies of the College of Physicians of Philadelphia*, 3rd series, 1901, *23*:303; see also, Thomas A. Horrocks, "A Selection of Treasures from the Historical Collections of the Library of the College of Physicians of Philadelphia," *Transactions & Studies of the College of Physicians of Philadelphia*, 5th series, 1987, *9*:12–13.

11. Miller, "John Stockton Hough (1845–1900)."

Review

FREDERICK B. WAGNER, Jr., ed. *Thomas Jefferson University: Tradition & Heritage*. 1104 pp. Philadelphia: Lea & Febiger, 1989. Price $120.00

Reviewed by JOHN L. McCLENAHAN

This is the story of how, in spite of "financial difficulties and personal disagreements" (p. 17), a rural academy in western Pennsylvania became an esteemed medical center in Philadelphia. Copiously illustrated and backed by two generous indices, it weighs seven pounds — not a volume to curl up with beside the fire. As an encyclopedia it offers all the benefits of such a format as well as the encumbrances, chiefly repetition. But even a casual perusal has its rewards, relating how devotion, passion, luck, and disaster welded together a diverse body of Philadelphia physicians into a thriving institution.

In 1802 President Jefferson gave various books and a portrait to a small college in Canonsburg, Pennsylvania, named in his honor. No medical school was as yet in prospect, but Jefferson, as engrossed in the art of healing as in everything else, laid down the duties of a young practitioner in his own elegant style: to serve as "a watchful but quiet spectator of the operations of nature" (p. 7) while exciting "good spirits and hope in his patient" (p. 7). Moved presumably by these sentiments Dr. George McClellan, in 1824, established a medical department in Philadelphia affiliated with Jefferson College which, under the moderating hand of Dr. Robley Dunglison, was chartered in 1838. Eventually the school went its separate way and flowered over a century as Thomas Jefferson University with four major divisions: Jefferson Medical College, the College of Graduate Studies, the College of Allied Health Sciences, and Thomas Jefferson University Hospital.

Sixty-three chapters document the University's physical growth from a renovated theatre to soaring pavilions, and its curriculum development from vitalism to cytotechnology. The doers were McClellan, Dunglison, Meigs, Pancoast, the Grosses, the Eakinses, and the Da Costas, from which lively company Dr. Wagner traces

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heritage rather than nostalgia. The narrative delicately veils vendettas and contentions, notably the reserved hospitality of a sibling institution, the University of Pennsylvania, during the early years of struggle. The authors take a broad view of their University's resources, citing its contributors, its indispensable laity, and even its regalia. Here and there in the book's pages lie nuggets of gleaming wit and engaging idiosyncracy: the epigrams of John C. Da Costa; the sidelong glance of Charlotte Cardeza; a benefactor's postmortem salvo at a shrewish wife, and her blithe rejoinder chiseled in stone.

All of which leaves us with something more than a collage. A tapestry, rather, figured with men and women, aspiration and achievement. And an occasion to reflect on a definition bequeathed us by the late Dr. A. Bartlett Giamatti, of Yale and the National League: "A university is the accumulation of memories of how the best people did it."[1]

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1. *New York Times,* 25 February 1984.

New Books In the History of Medicine in the Historical Collections of the Library, July Through September, 1989

JACK ECKERT

Linda Bryder, *Below the Magic Mountain: a Social History of Tuberculosis in Twentieth-Century Britain* (Oxford: Clarendon Press, 1988).

Thomas Buckley and Alma Gottlieb, eds., *Blood Magic: the Anthropology of Menstruation* (Berkeley: University of California Press, 1988).

James M. Byers, *From Hippocrates to Virchow: Reflections on Human Disease* (Chicago: ASCP Press, 1988).

Edwin Clarke and L. S. Jacyna, *Nineteenth-Century Origins of Neuroscientific Concepts* (Berkeley: University of California Press, 1987).

Adam Crabtree, *Animal Magnetism, Early Hypnotism, and Psychical Research, 1766–1925: an Annotated Bibliography* (White Plains: Kraus International Publications, 1988).

Diana B. Dutton, *Worse Than the Disease: Pitfalls of Medical Progress* (Cambridge: Cambridge University Press, 1988).

Stuart Galishoff, *Newark: the Nation's Unhealthiest City, 1832–1895* (New Brunswick: Rutgers University Press, 1988).

Bryan Gandevia, Alison Holster, and Sheila Simpson, *An Annotated Bibliography of the History of Medicine and Health in Australia* (Sydney: Royal Australasian College of Physicians, 1984).

Sander L. Gilman, *Difference and Pathology: Stereotypes of Sexuality, Race, and Madness* (Ithaca: Cornell University Press, 1985).

Ruth P. Goldschmidt-Lehmann, *A Bibliography of Anglo-Jewish Medical Biography* (Jerusalem: Jerusalem Academy of Medicine, 1988).

David G. Green, *Working-Class Patients and the Medical Establishment: Self-Help in Britain from the Mid-Nineteenth Century to 1948* (New York: St. Martin's Press, 1985).

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George Griffenhagen and Ernst W. Stieb, *Pharmacy Museums and Historical Collections in the United States and Canada* (Madison: American Institute of the History of Pharmacy, 1988).

Ruth Roy Harris, *Dental Science in a New Age: a History of the National Institute of Dental Research* (Rockville: Montrose Press, 1989).

Sylvia D. Hoffert, *Private Matters: American Attitudes toward Childbearing and Infant Nurture in the Urban North, 1800–1860* (Urbana: University of Illinois Press, 1989).

Danielle Jacquart and Claude Thomasset, *Sexuality and Medicine in the Middle Ages* (Princeton: Princeton University Press, 1988).

Anne Hudson Jones, ed., *Images of Nurses: Perspectives from History, Art, and Literature* (Philadelphia: University of Pennsylvania Press, 1988).

Clarence J. Karier, *Scientists of the Mind: Intellectual Founders of Modern Psychology* (Urbana: University of Illinois Press, 1986).

Yosio Kawakita, ed., *History of Diagnostics: Proceedings of the 9th Annual Symposium on the Comparative History of Medicine — East and West* (Osaka: Division of Medical History, Taniguchi Foundation, 1987).

Howard Clark Kee, *Medicine, Miracle and Magic in New Testament Times* (Cambridge: Cambridge University Press, 1986).

Sir Geoffrey Keynes, *A Bibliography of the Writings of Dr. William Harvey, 1578–1657*, third edition, (Winchester: St. Paul's Bibliographies, 1989).

Edward B. MacMahon and Leonard Curry, *Medical Cover-ups in the White House* (Washington: Farragut Publishing Company, 1987).

Roy MacLeod and Milton Lewis, eds., *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion* (London: Routledge, 1988).

Lydia Mez-Mangold, *A History of Drugs* (Totowa: Barnes & Noble Books, 1986).

W. J. O'Connor, *Founders of British Physiology: a Biographical Dictionary, 1820–1885* (Manchester: Manchester University Press, 1988).

Teizo Ogawa, ed., *History of Traditional Medicine: Proceedings of the 1st and 2nd International Symposia on the Comparative History of Medicine — East and West* (Osaka: Division of Medical History, Taniguchi Foundation, 1986).

Judith A. Overmier, *The History of Biology: a Selected, Annotated Bibliography* (New York: Garland Publishing, 1989).

Roy Porter and Andrew Wear, eds., *Problems and Methods in the History of Medicine* (London: Croom Helm, 1987).

Paul Robinson, *The Modernization of Sex: Havelock Ellis, Alfred Kinsey, William Masters and Virginia Johnson* (Ithaca: Cornell University Press, 1989).

Nicolaas A. Rupke, ed., *Vivisection in Historical Perspective* (London: Croom Helm, 1987).

Todd L. Savitt and James Harvey Young, *Disease and Distinctiveness in the American South* (Knoxville: University of Tennessee Press, 1988).

Walter Schatzberg, Ronald A. Waite, Jonathan K. Johnson, eds., *The Relations of Literature and Science: an Annotated Bibliography of Scholarship 1880–1980* (New York: Modern Language Association of America, 1987).

Rosemary Stevens, *In Sickness and in Wealth: American Hospitals in the Twentieth Century* (New York: Basic Books, 1989).

Charles Vevier, ed., *Flexner: 75 Years Later* (Lanham: University Press of America, 1987).

Joel-Peter Witkin, ed., *Masterpieces of Medical Photography: Selections from the Burns Archive* (Pasadena: Twelvetrees Press, 1987).

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